Chemical Age

U.K. ECONOMY AND THE BUDGET
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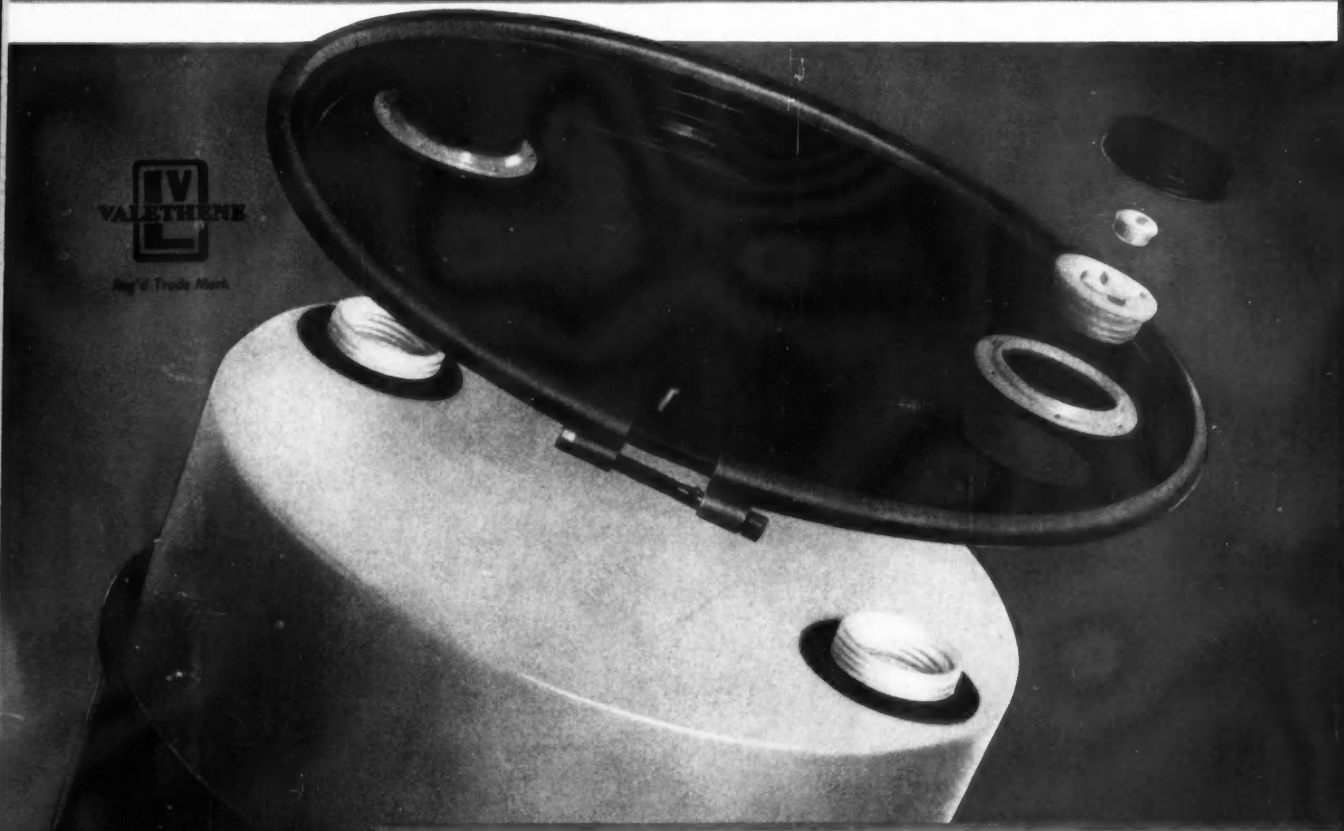
VOL. 81 No. 2074

11 April 1959



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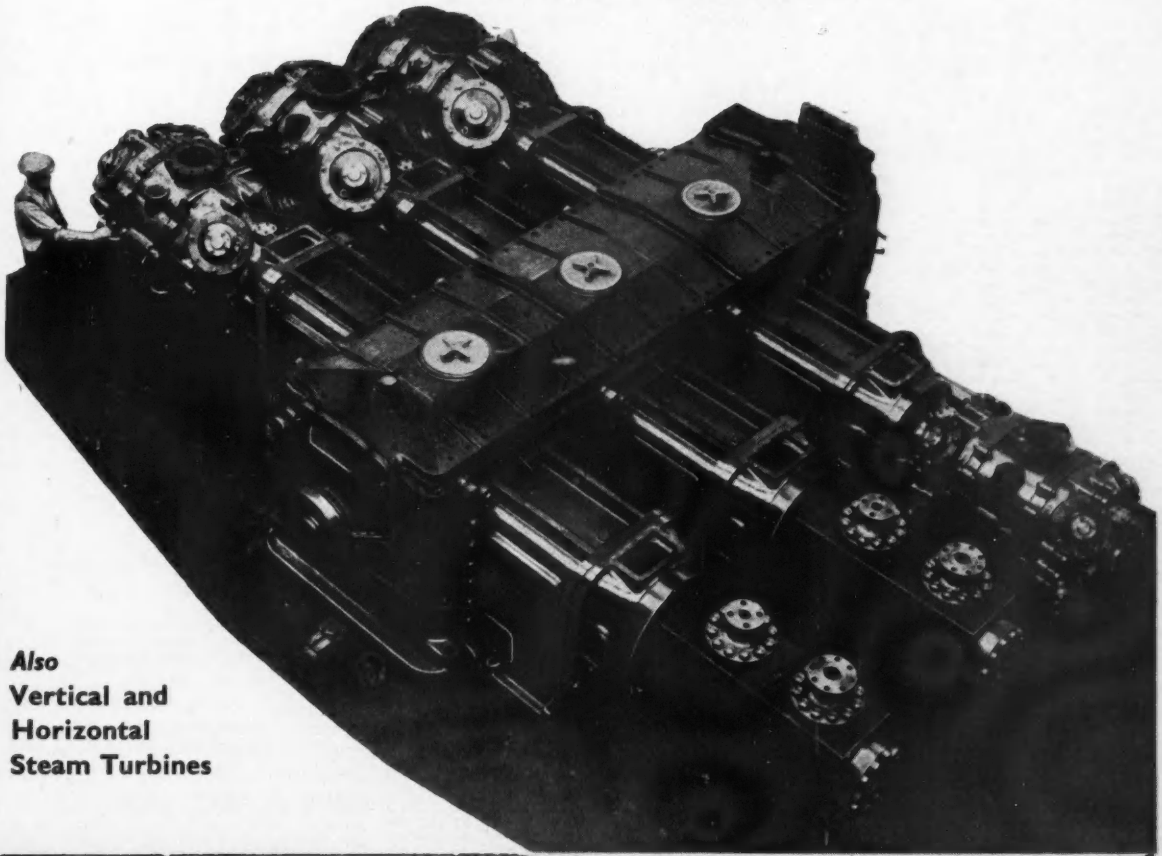

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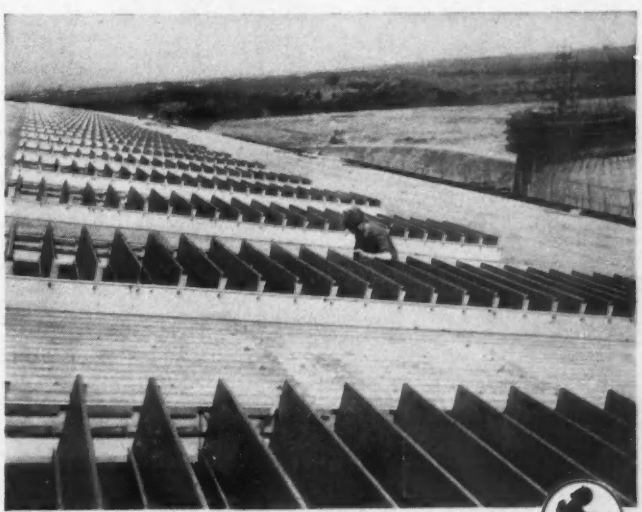

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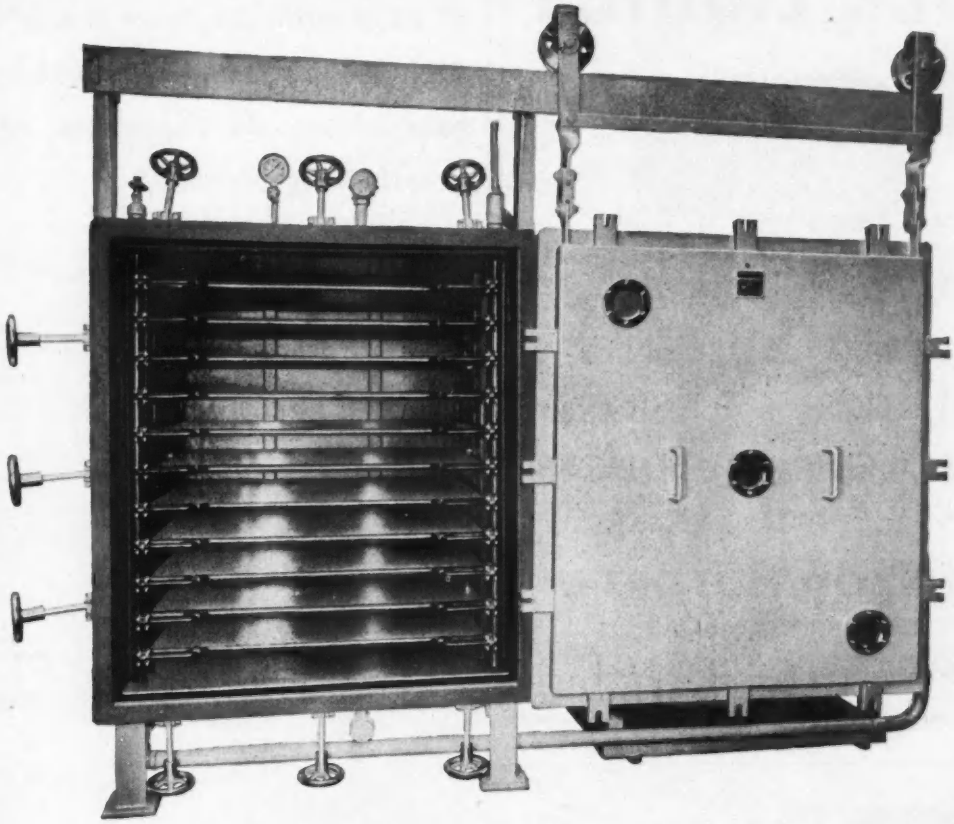

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- ★ **for making patterns, models, jigs and tools.**
- ★ **as fillers for sheet metal work.**
- ★ **as protective coatings for metal, wood and ceramic surfaces.**

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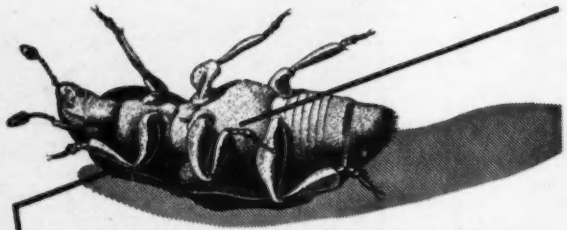

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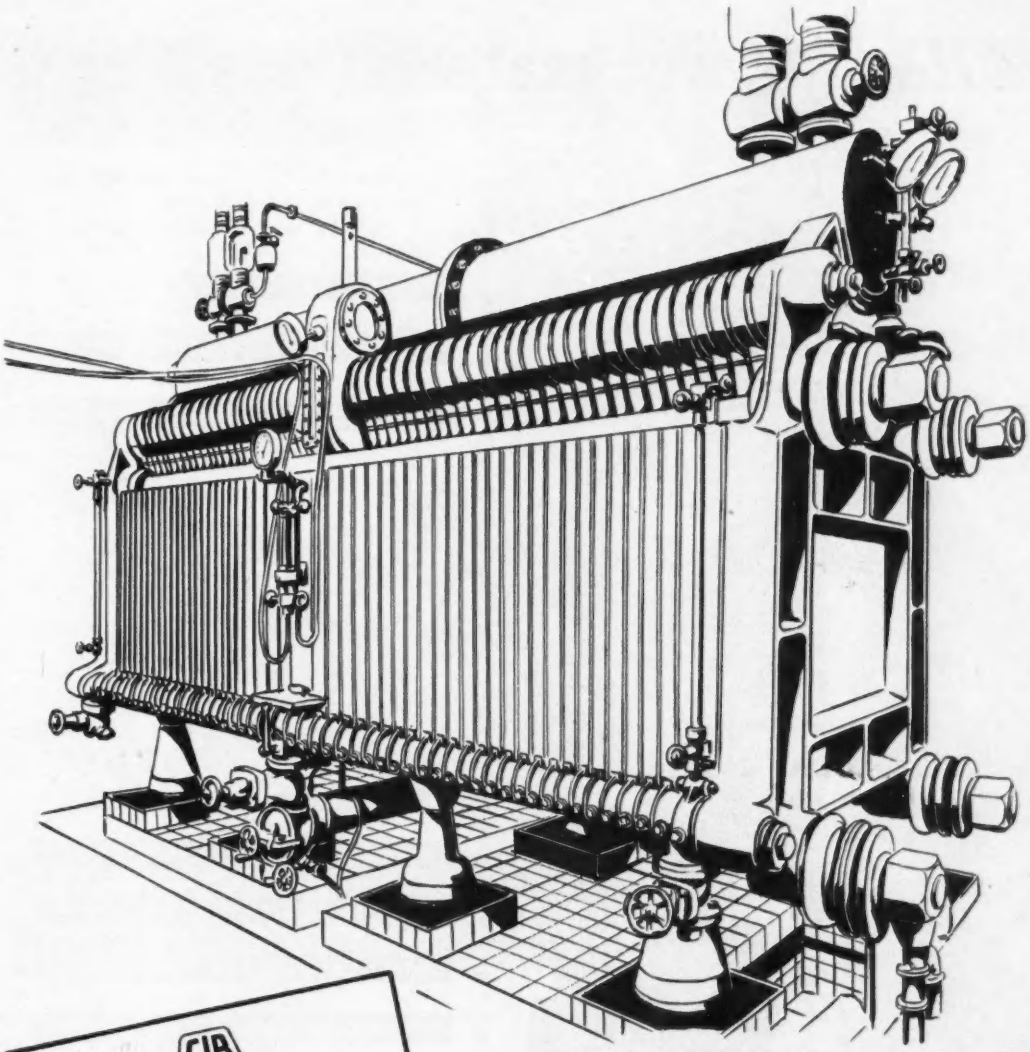

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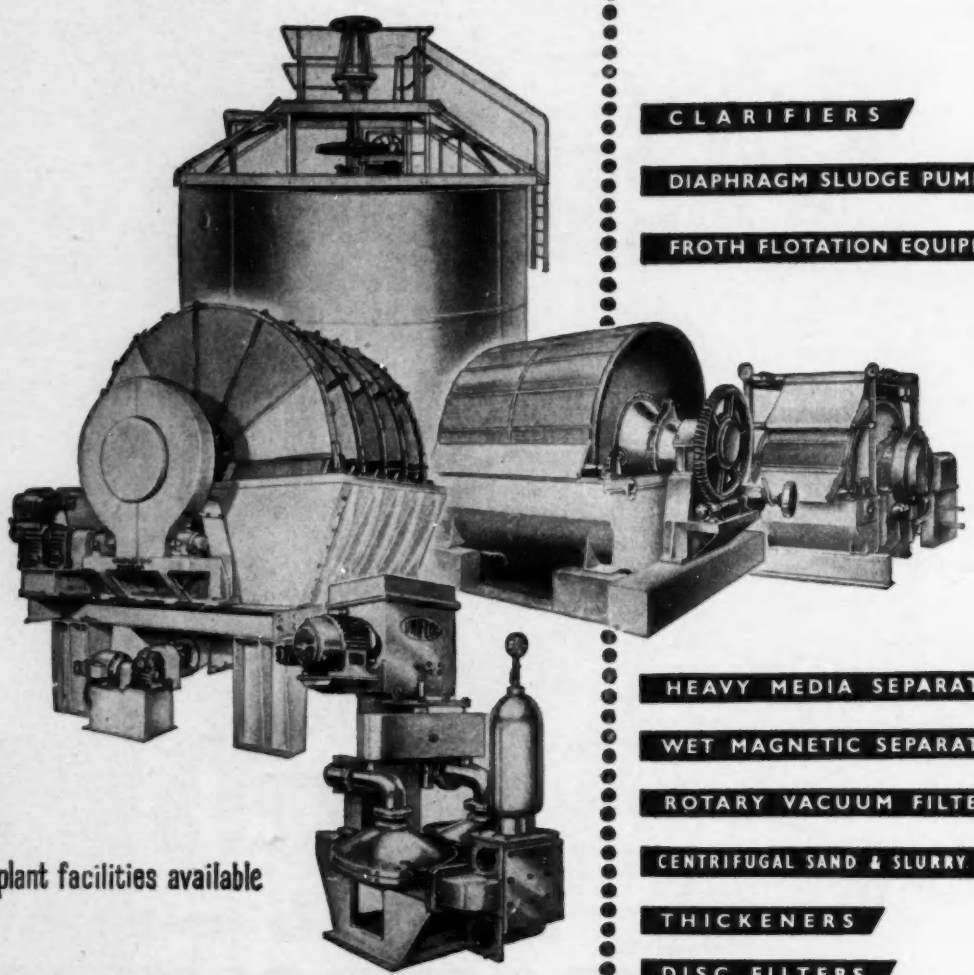

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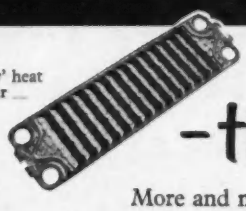

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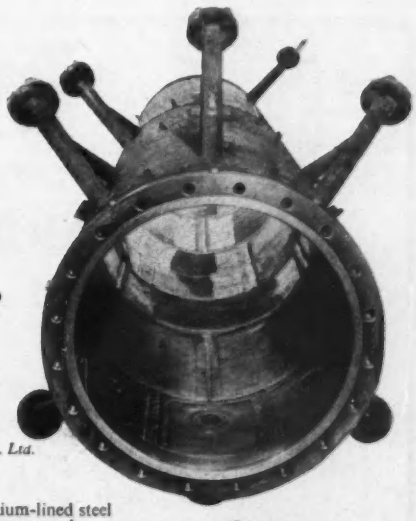

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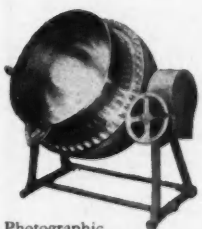

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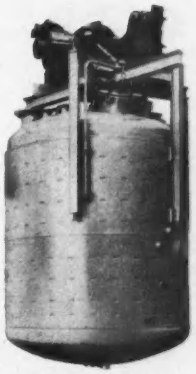

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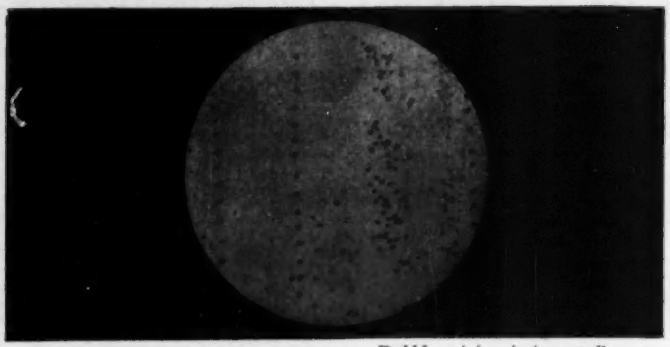

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CHEMICAL AGE

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THE TECHNICAL PRESS

THE British chemical industry is particularly well served by its trade and technical press. There are, however, many companies which believe they can do without it both as an advertising medium and as a means of publicising their activities. So far as the latter point is concerned we made our views clear in our 7 March editorial entitled 'Too Much Secrecy'.

Now *World's Press News*, the trade journal of the British press, has taken up the cudgels on behalf of the trade and technical press. Why, they ask, is this vital section of the press so often omitted from advertising schedules when campaigns are planned? It is believed that the situation can only have arisen out of the ignorance of those who ought to know better.

It is stated 'The trade press is an integral part of the economic life of Britain. Without it, the innumerable trades and industries to which we owe our prosperity, would cease to thrive and expand. The technical journals are often the means by which industry is modernised; the trade periodicals help to sell the goods which industry produces. In either field the press is indispensable'.

Without this press there could be no interchange of ideas on methods and techniques; efficient marketing would be within the means of only a few select firms. Trade would decline and with it, the national prosperity.

"So it follows that when Britain thrives her trade and technical press thrives also. This is undoubtedly true of the present. Never has the future looked rosier for this press—provided that those who benefit by it . . . . understand its function and give it the support it so eminently deserves . . . . The press is the only means by which modern tradesmen and technicians can hope to keep abreast of new developments".

Many busy executives and scientists in the chemical industry do not have a true appreciation of their press. This is not altogether surprising, because there are many journals in this field, in most cases each doing a different job and doing it well. Most of the journals are highly specialised monthly publications appealing to particular sections of the industry.

CHEMICAL AGE, too, has a unique place in the industry's press. Since this journal was founded by the late Sir Ernest Benn 30 years ago, it has consistently been the leading weekly newspaper of the British chemical industry, of chemical engineering and industrial chemistry. This service is now tailored to modern methods of lay-out and presentation to save the reader's time and to make the news more readily readable.

Each week, CHEMICAL AGE publishes news of technical, economic and commercial developments often exclusively and usually well ahead of other journals. A fast, accurate and wide news coverage is part of the service that the live technical newspaper must give if it is to retain the respect and confidence of its readers.

This is a job that only the weekly journal can do—likewise the publication of lengthy specialised articles is the province of the monthly journal and one which has no place in a virile weekly newspaper. That the two types of journal are complementary and not competitive is a fact that is not widely appreciated in the industry. The executive, chemist, engineer, or buyer wishing to keep up to date with developments can only do so through the weekly publications.

U.K. ECONOMY

THAT the U.K. economy is now in a much stronger position has been obvious from the first few months of this year. Demand and production are rising and the Government, according to the *Economic Survey 1959*, will do "all it can to foster this expansion." This seems to indicate that the official view is that there will be an expansion and that the Government intend that it shall be rapid and extensive.

Of interest are the tables showing how production has risen in a number of industries without any comparable increase in the labour force. In particular, the chemical industry exemplifies this, and with spare capacity in both labour and plant and the stimulus to raise output, there is clearly no danger of expansion being hindered by a lack of industrial resources.

There are qualifications to this optimistic picture, nevertheless. Last year saw a downward trend in stocks, total investment being nearly £300 million less than in 1957. This trend seems to have stopped towards the end of the year, but was big enough, however, to have a significant impact on industrial activity. The survey points out that although the wage increase was less than in the previous years, it was still greater than the rise in productivity. A rise in wage rates without a corresponding increase in productivity will threaten the recently achieved near-stability of prices.

A third proviso relates to exports and the balance of payments. During this first part of the year, exports are expected to continue to decline. In the chemical industry, the reverse is noted however. Already chemical exports have recovered from the 3% decline experienced in 1958 and are in fact above the record levels of 1957. The industry itself feels that there is no doubt that the slow but steady climb in exports has been resumed and the indications are that this will be maintained.

On the other hand, the fall in commodity prices has definitely come to an end, although no large rise in these prices seems likely. The best opportunities for exports, it is suggested, lie in manufacturing countries rather than in primary producers.

U.K. chemical plants have capacities that would provide room for expansion in export shipments, but any large increase here is dependent on new markets being found and developed. The best prospects in this respect have been suggested by Mr. S. P. Chambers, an I.C.I. deputy chairman (CHEMICAL AGE, 21 March, p. 497) as being outside the Common Market countries and the sterling area, and both North and South America. Any big development in trade with the Soviet Union, the European Communist bloc or with mainland China, however, would call for much active organisation.

Any general industrial improvement in 1959 will certainly aid the heavy chemical industry which did not have a good year in 1958. The signs are that this will occur. But it is doubtful if 1959 will see any great improvement in the profitability of operations. Increased export competition and higher raw material costs are factors which, combined, hit profit margins, and there is no indication that this pressure will lessen in the coming months.

BUDGET 1959

HOPES indicated in the *Economic Survey 1959* of the Government's desire to improve the competitiveness of the economy have been realised in the 1959 Budget. The stimulants given are such as must encourage modernisation and enterprise, while at the same time price stability so far attained is not jeopardised. In fact, the Budget has been designed to give an uplift to expansion, without raising costs of production, distribution and transport. It is to be hoped that of the major remission, that of £192 million off income tax, a large part will be devoted to investment in some form and will assist in maintaining the wages structure.

Investment allowances have been restored at the rate of 20% for new plant and machinery plus 10% initial allowance (replacing the up-to-the-Budget initial allowance of 30%); and 10% for new industrial buildings, plus 5% initial allowance (replacing the previous initial allowance of 15%).

Welcome indeed is this conversion of a large part of the initial allowances on industrial capital expenditure into investment allowances the value lying in that they give permanent rather than temporary relief, since it will be the permanent relief which will allow expenditure on improvements, etc. The present reliefs, however, will not provide further assistance to an industrialist who is hesitant to set up new plant through shortage of finance; any stimulating effect, it is suggested, will be due to the subsidy element which will accrue to him in later years. So allowance for investment is given a moderate rather than a direct additional stimulus. This can be regarded as not unhelpful. It has been noted for some time past that reserves of manufacturing capacity have been mounting as a result of the intensive investment since 1953; this is particularly the case in the chemical industry. The idle industrial capacity is an indication of the acuteness of international competition.

The challenge in export markets means that British industries, and notably the chemical industry, must maintain efficiency in order to keep their present position, let alone improve it. A noteworthy item which should assist transport costs for chemical manufacturers is the ending of the 30% purchase tax on chassis of commercial vehicles.

Another feature of the Budget, long overdue it is felt, is that concerning directors' remuneration. A 'small relief' from the restriction on the amounts that might be deducted for profits tax purposes for the remuneration of directors is announced. This proposal would vary the present scale of maximum amounts payable so that it becomes: £3,000 for one full-time working director, £5,000 where there are two, £7,000 for three and £9,000 for four or more such directors. The alternative limit of 15% of the profits, subject to a ceiling of £15,000, will remain unchanged. This relief will cost about £3 million in a full year.

GRAFT POLYMERISATION

WIDER production of graft polymers may be possible through radiation catalysis, it is reported from the U.S. American Machine and Foundry are said to be marketing shortly a new ion exchange membrane, described as a sulphonated graft copolymer of styrene and polythene and possessing high permselectivity and low electrical resistivity. Selling price will be well below the approximately $2/sq. ft. level of present permselective membranes.

For imparting desirable surface characteristics to fluorocarbon polymers Radiation Applications Inc., New York, U.S., are reported to have an economical radiation-grafting technique (see CHEMICAL AGE, 21 February, p. 330). Monomer is grafted on to a fabricated fluorocarbon polymer—tape, film, wire, etc.—under the influence of relatively low doses of radiation. The products are stated to be much more easily bonded and dyed than straight fluorocarbon polymers.

Graft polymerisation has had a limited success up to date, the only big commercial graft polymer being high-impact polystyrene. In the U.K. BX Plastics Ltd. use chemical catalysts to graft methyl methacrylate monomer on to natural rubber latex. Also under investigation in this country, it is reported, is a technique, whereby a fluorocarbon polymer is heated sufficiently to form free radicals on its surface, then dipped into a monomer (e.g. styrene) to produce a printable-surface graft polymer.

EUROPEAN FREE TRADE AREA OR COMMON MARKET?

ABCM FTA Committee Chairman's Views

ADOPTION of the Boy Scouts' motto 'Be prepared' was most likely to lead the U.K. chemical industry to success. It would certainly lead the industry to establish itself in the Common Market. This was the view expressed by Mr. W. A. M. Edwards, controller of purchases, Imperial Chemical Industries Ltd., and chairman of the Association of British Chemical Manufacturers' Free Trade Area committee, at a meeting of the London Section of the Society of Chemical Industry on Monday. Mr. Edwards' talk was on 'European Free Trade Area or Common Market?'

Some 15 months ago when Mr. Edwards was asked to address the London section, the free Trade Area (F.T.A.) and Common Market seemed probable—"It was in embryo: it will be a lusty child". Mr. Edwards said that having regard to what had taken place in the F.T.A. negotiations, he would not prophecy whether there would only be a F.T.A. rather than a Common Market.

Mr. Edwards, in a most excellent survey, reminded the meeting of the events leading up to the suggestion of the Common Market and the signing of the Treaty of Rome in March 1957.

Origin of Goods

Origin of goods was discussed by Mr. Edwards. The U.K., he said, had felt that this problem could best be approached by an added value, i.e. 50% added value. The question of process definition, Mr. Edwards illustrated by considering phenol. Thus, phenol of F.T.A. origin if made in the area from benzene would have 50% added value. Apart from the complexities of the chemical industry, it had appeared that the U.K. proposal of 50% added value might be acceptable to the other European countries (see CHEMICAL AGE, 18 October 1958, pp. 629, 632). With regard to rules of origin for organic chemicals, there was the Brussels nomenclature which had been adopted (CHEMICAL AGE, 1 November, p. 718).

It had been laid down, therefore, that if the chemical was produced by a complicated process there was a 50% added value to the final product. If an easy chemical transformation was involved then the raw material had to be made in the area. Where the product was a costly one it was not necessary to state the origin.

Thus if phenol was made from monochlorobenzene, 50% added value was necessary, but the phenol was to be considered free of F.T.A. duty if made from coal tar as the phenol produced from this source would be costly.

Dimethylphthalate would only be of F.T.A. origin if made from phthalic anhydride. There was thus a need for an adequate degree of chemical transformation for the F.T.A. The A.B.C.M. committee for F.T.A. had also determined that for dyestuffs it was possible to apply the same principles for added value as in the organic chemicals section. These U.K. proposals had been considered by the interested countries to be workable.

Provisos for the F.T.A. were listed:

(1) Adequate anti-dumping rules throughout the area.
(2) Government assistance to development areas.
(3) Rules of competition.
(4) Discrimination in imports due to registration.
(5) Possible exclusion of agricultural products used as chemical raw materials.
(6) Patents and trade marks.
(7) Packaging.
(8) Shipping difficulties.
(9) Hydrocarbon oils and revenue duties.
(10) Standards for chemicals.

Discussing some of the above, Mr. Edwards said that dumping was likely to be most serious in the early years of F.T.A. when different duties would be imposed. The committee had discussed the suggestion of retrospective duties with the Board of Trade, but it had been ruled that it would not be in line with U.K. legislation. Also the rules would apply to other countries. Government assistance to development areas would have to be watched carefully and with regard to restrictive trade practices, there were five articles in the Treaty of Rome on this subject. The action taken by the West European Potash syndicate was instanced. Mr. Edwards also indicated that it was believed that some U.K. producers had already concluded agreements with regard to fixing prices, etc.

Mr. S. P. Chambers' lecture to the Plastics Institute was mentioned (CHEMICAL AGE, 21 March, p. 497). This had brought out many interesting points stated Mr. Edwards.

Comparing the turn over of O.E.E.C. in 1957 with 'guesstimated' figures for 1970, it was seen that turnover in Common Market countries would be about double the 1957 turnover, whereas the U.K. figure would only rise by 65%. This was on the assumption, of course, that the present rate of growth was maintained and overlooked entirely the effect of discrimination by the C.M. countries. The rate of growth in other O.E.E.C. countries was less, however, than that of the Common Market. In their case 1970 turnover would on the same assumptions be only 50% up by 1970.

Comparing U.K. and W. Germany, Mr. Edwards noted the greater percentage of West German exports. W. Germany was also getting a greater share of O.E.E.C. countries' trade and this share was also growing at a faster rate.

The rise in exports was noticeably faster to industrialised countries, and Europe was a rapidly expanding market. Of the share of world exports, the U.S. had 19.8%, W. Germany 27% and the U.K. 10.7%. Western Europe was very satisfactory for U.K. goods as there was greater economic stability there. The U.K., Mr. Edwards considered, should have multilateral trading with O.E.E.C. countries.

U.K. chemical exports would only go up 65% but Germany was doubling her exports and exporting half of all the chemicals she produced, stated Mr. Edwards. He showed that in chemical exports of the Common Market countries approximately 50% of their exports go to O.E.E.C. countries. This was also true of O.E.E.C. countries with the exception of the U.K. where the percentage of exports going to O.E.E.C. countries is less than 30% of the total chemical exports.

U.K. chemical exports to the Common Market area in 1951 totalled £122 million or just under 20% of our total chemical exports. Most, if not all this trade was likely to be lost if there was no F.T.A.

On the question of tariffs, Mr. Edwards said that the U.K. was in a position where active discrimination was now taking place against her, but it was not yet serious. He warned, however, that it would intensify. At present W. Germany had reduced her duty by 25% (in 1957) and in other O.E.E.C. countries there was a 10% duty. The U.K. would not enjoy the benefits of the Benelux and Scandinavian tariffs as these were already low. The U.K. was also excluded from the 3% quotas of the 'Six'. Quotas were having an effect in certain sections of the chemical industry, particularly in plastics.

U.S. Investments

It was pointed out by Mr. Edwards that the F.T.A. and Common Market embraced some 150 to 200 million people, whereas the U.K. and the total population of Switzerland, Scandinavia and Austria was much less and did not offer the great attractions of the F.T.A., etc. He also noted the "spate of investment in Europe by U.S. companies" in recent months and there was already a suggestion that agents of British chemical companies were looking elsewhere for agencies. There had to be a real determination to make the Common Market work and this would be in the face of intense competition.

In France there were the Lacq natural gas deposits and natural gas in the Po Valley of Italy, which could be used by the chemical industries. Despite this the U.K. should be no worse off, if not better placed, for she had plentiful basic raw materials such as coal, salt, limestone and water. The U.K. was at a disadvantage, however, with regard to freight and transport costs. Mr. Edwards instanced phosphate rock imports. This country paid about 10s a ton more compared with European producers because of high freights, and longer and more expensive ship turnround times.

West Germany's chemical industry show no signs of slackening off, Mr. Edwards reported, and, moreover, was she not satisfied with her export levels. A combined West and East Germany would be formidable. The Economist Intelligence Unit had shown that if there was no F.T.A., the U.K. share of Europe's chemical market was likely to drop 4%.

(*Continued in p. 616*)

★ WHEN Beecham Group Ltd. announced that their new synthetic penicillins would be developed with an American concern (CHEMICAL AGE, 14 March, p. 453) it was fairly obvious that the company concerned would be either Merck or Bristol Laboratories Inc. The main reason why speculation centred on these two companies was that they had been associated with Dr. J. C. Sheehan of the Massachusetts Institute of Technology in his work on penicillin synthesis.

Now Beecham announce that they have signed an agreement with Bristol Laboratories, Syracuse, N.Y., under which the latter have been given special rights to make the penicillins dissovered by Sheehan. The decision to collaborate was the result of major technical developments in the synthesis work in both countries. Beecham's have synthesised about 200 new penicillins since their recent successful production of the basic nucleus of pencillin—6-amino-penicillanic acid.

As a result of the agreement, any new penicillins resulting from joint Beecham and Bristol research will be produced in the U.S. This should bring substantial dollar royalties to Britain.

★ I was interested to see that, prompted by the recent case of the boys who played with radioactive waste in the grounds of a clock factory, the Scottish Council of the Labour Party has called for measures to prevent danger from the disposal of radioactive waste from industrial establishments.

The following precautions are urged:

Compilation of a register of sources of radioactivity which should be available to local health authorities.

More stringent recommendations to industrial establishments concerning methods of storing and disposing of radioactive waste, and communication of these recommendations to local health authorities in the areas concerned.

Local health authorities given responsibility for determining whether there are adequate safeguards to prevent public access to sources of radioactivity.

★ BRITISH Chemical industry's need for more references to Russian developments in the chemical field will be met by the Chemical Society's aims to publish translations of the main Russian chemical journals. With the support of the Department of Scientific and Industrial Research and starting with the January 1959 issue the society is to publish a cover-to-cover translation of the monthly journal *Zhurnal neorganicheskoi Khimii*, a publication of the Academy of Sciences of the U.S.S.R. dealing with inorganic chemistry. Translation is to be undertaken for the Society, I learn, by Inforsearch Ltd. and the executive editor of the publication will be Professor P. L. Robinson. He will be assisted by an advisory panel of distinguished inorganic chemists

Translations will be issued in monthly parts as soon as possible after the Russian original is available. The annual subscription rate will be £30 (U.S. $90), but there will be a discount of 25% for universities and technical colleges. Single issues will be £4 (U.S. $12).

The Society also hopes to start publication within the next 12 months of translations of the Russian 'Journal of Physical Chemistry' (*Zhurnal fizicheskoi Khimii*) and 'Progress in Chemistry' (*Uspekhi Khimii*).

★ UNDER the name of Grisovin, the antibiotic golseofulvin, has been found to be effective for the treatment of ringworm and other fungoid diseases; it is being marketed by Glaxo Ltd. It is unusual in being taken by mouth.

Large-scale production has begun at the Glaxo deep fermentation plant at Ulverston, Lancs. A deep fermentation method of making griseofulvin, previously obtainable only in small quantities, was evolved at the Glaxo fermentation research division at Sefton Park, Stoke Poges, Bucks.

Glaxo have patented the process and are negotiating manufacturing licences with companies in several parts of the world.

★ SPECULATION as to the percentage of chemical business accounted for in the Royal-Dutch Shell's annual turnover has been rife since Shell Petroleum and the Dutch company set up four new subsidiaries last week. This reorganisation reflects the growing importance of the group's chemical activities.

Two of the new companies will deal with chemicals—Shell International Chemical and the Dutch equivalent. In some quarters it is thought that Royal-Dutch Shell are now the world's largest petrochemical group; although they are not the largest in the U.K.

Last week *The Financial Times* put the group's chemical interests at 8% of total sales; *The Times* at between 5 to 10%. In the 1958 prospectus it was stated that chemical plants had a net book value of £64 million, out of a grand total of just over £1,000 million. I hope that the reorganisation will lead to more details being released about the group's chemical activities.

★ A RADICALLY new lifeboat that will always right itself if capsized and a new type of commercial van body are two new uses for polyester resins. The van body, designed and made from reinforced Bakelite polyester resin by Samlesbury Engineering of Lancs, requires no metal supporting framework, is constructed from two basic types of prefabricated reinforced resin panels—one for the sides and one for roofing.

Reinforcing ribs are moulded in to give the panels rigidity. The whole structure is secured to the floor and bearers by light alloy angle. Damaged panels can be replaced in about 30 minutes. Other uses that may be developed are in the production of containers, portable sheds, garages or other prefabricated buildings.

The new lifeboat is designed on the lines of a submarine and is completely enclosed. It has four hatchways for entry that can be hermetically sealed to keep water out even in rough seas. Occupants are also protected from adverse elements of air and temperature. Two bubble-hatch windows—like the astradomes of war-time bombers—enable a look-out to be kept. Boat walls are of glass-fibre reinforced polyester and hard p.v.c. foam in sandwich form. This commination gives the extraordinary strength required. The polyester resin was supplied by Reichhold Chemie A.G., Hamburg.

★ THE pipeline that will take effluent from the Atomic Energy Establishment at Winfrith Heath, Dorset, into the sea at Arish Mell will have what is believed to be the longest underwater outfall in this country. It will run for five miles overland and for about a further two miles out to sea. The undersea route will follow the profile of the sea bed, except in a few places where a trench will be prepared by blasting through reefs and rock.

Work on the sea section will begin on 27 March or soon after and will continue until about the end of September. Contract for the first four miles of the overland section from the site boundary has been awarded to Constructors John Brown. Taylor Woodrow Construction Ltd. have gained the contract, in association with Collins Submarine Pipelines Ltd., for the remaining mile of overland piping and for the undersea section.

★ MY PLEA for suppliers of 'spot' quantities of 4-nitro-3-hydroxy benzoic acid and 2:7-diamino phenylene oxide has brought in some helpful suggestions. It is suggested that preparation of 4-nitro-3-hydroxy benzoic acid should not be too difficult since the corresponding aldehyde is commercially available. The second substance 2:7-diamino-*di*phenylene oxide or 2:7-diamino dibenzofuran, is a reagent for chromium. It can be synthesised from 2,2'-benzidine disulphonic acid.

For those in search of rare substances, I am reminded that the Grosvenor Laboratory specialises in the preparation of rare organic chemicals. The laboratory—from 1939 to 1948, the London chemical headquarters of Dr. C. Weizmann—has had long experience in this type of work.

Alembic

NEWTON CHAMBERS TO SUPPLY BISCHOFF PURIFIERS FOR S.G.B. LURGI GASIFICATION PLANT

TO be incorporated in the Lurgi pressure gasification plant which the Scottish Gas Board are building at Westfield on the border of Fife and Kinross is a new type of tower purifier installation never before used in Britain. The contract for building the purifiers has been awarded by the Scottish Gas Board and Humphreys and Glasgow Ltd. (the main contractors for the erection of the works) to Newton Chambers and Co. Ltd., of Thorncliffe, near Sheffield. Cost of the installation will be about £150,000.

The purifiers—with a capacity of 30,000,000 cu. ft. of gas per day—are of the Bischoff type for high pressure operation. Newton Chambers recently concluded an agreement with the firm of Bischoff of Essen whereby they acquired the exclusive rights to build these purifiers and other specialist plant in Britain.

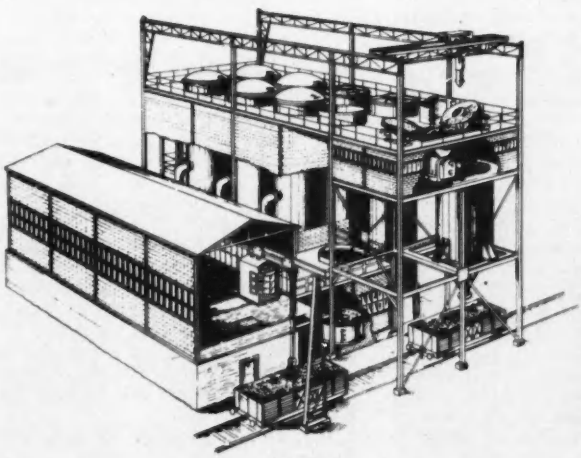
The Bischoff system has been specially designed and proved for high-pressure operation. It eliminates the large number of valves usually associated with oxide purification systems, and oxide handling is fully mechanised to reduce labour requirements.

In the production of town gas, the crude gas has to pass through various purification processes. Normally the hydrogen sulphide in the gas is removed when the gas passes through large boxes or large towers of oxide of iron. In high-pressure gasification by the Lurgi process, hydrogen sulphide is removed at two different points in the stream. Most of it is removed when the gas passes through the Benfield washing plant, but the primary purpose of the Benfield plant is to remove carbon dioxide which is present in larger quantities in the Lurgi process than in conventional systems; it is to remove the remaining traces of hydrogen sulphide that the Bischoff tower purifiers are being installed.

The installation visualised for the Scottish Gas Board's plant will comprise two parallel streams each of four high-pressure tower purifiers and will operate at a pressure of more than 300 lb. per sq. in.; each purifier containing a number of trays filled with a specially prepared mixture of oxide of iron. Normally gas will pass through both streams, but at fixed intervals of about 21 days the gas will be shut off one stream, all the gas passing temporarily through the other The idle stream will then be de-pressurised and purged with inert gas, and the purifiers will be opened by removing the special quick-opening covers at the top of each tower to enable the trays to be removed.

The oxide in the trays in the first of the four towers by this time will have maximum sulphur content, and can be removed and placed on the stock heap for sale. The trays taken out of the other three towers are then moved up, the last tower in the series being filled with trays containing a completely new mixture. An overhead crane performs this complete sequence of oxide rotation in a few hours, following which both streams of purifiers are available for operation.

This rotation of the oxide in relation to the towers is a patented feature of the Bischoff system. Stocking towers, in which trays of oxide will be stored during the emptying and filling operations, are provided.



An artist's impression of a typical installation of the Bischoff high-pressure purifiers to be installed at the Scottish Gas Board's Lurgi gasification plant at Westfield

HyL Direct Iron Ore Reduction Process Licensed to Kellogg

NATURAL gas is employed in the HyL direct iron ore reduction process for making sponge iron which, it is claimed, has opened the door to economical production of steel in many parts of the world hitherto unable to establish a steel industry.

In addition the HyL process offers non-integrated speciality steel producers a means of integrating steel production facilities without resort to a blast furnace.

The process was developed by Hojalata Lamina S.A., one of Mexico's principal steel producers, with engineering assistance from the M. W. Kellogg Company of New York, who hold the world rights in the process.

Many countries with good supplies of iron ore have been hindered in developing a steel industry because of their lack of coking coals, the often prohibitive cost of operating a steel industry dependent on imported raw materials and the economics of blast furnace operation. These often require production rates beyond the consumption rates of some nations and many speciality steel producers.

The HyL sponge-iron process, which uses natural gas or light hydrocarbons in place of coking coal, provides a means of building an economic steel-producing industry in many areas which are now dependent on imports for their steel but have good supplies of both iron ore and natural gas.

The HyL process yields a sponge iron which may be substituted for pig iron or scrap in making steel. In the Fierro Esponja plant at Monterrey, Mexico, Durango hematite ore is reduced in fixed bed, batch type reactors by direct gaseous reduction. The reducing gas, approximately 85% hydrogen and carbon monoxide and the remainder carbon dioxide, methane and water vapour, is obtained from natural gas. The natural gas is first desulphurised and then passed through a Kellogg high-pressure, steam reforming furnace.

Five reactors using the HyL process are operated at the Fierro Esponja plant. The reaction cycle requires four hours with an additional 30 minutes for dumping and charging. The reduction process for all reactors is controlled from a central control house. Reactor dumping is controlled from an outdoor platform. At any moment each reactor is at a different stage in the process cycle, making it possible for one labour crew to operate all reactors. A reactor is dumped every hour.

In operation, ore ranging in size from ¼ to 1¼ in. is charged to the reducing reactors. In the 200 T/D plant, each reactor holds about 30,000 lb. of ore. About 21,000 S.C.F. of natural gas is required per ton of reduced ore. The reducing gas reformed from natural gas is used under conditions of maximum thermal efficiency.

Final ore reduction takes place within a temperature range of 1,600° to 1,900°F. The reduced product retains the approximate size of the charged ore but becomes porous. The hot sponge iron is discharged from a reactor to a hopper for transport to a melting furnace.

ESSO'S C-OIL NOW BEING MARKET DEVELOPED IN U.K.

MARKET development for the new Esso resin C-Oil (see CHEMICAL AGE, 21 March, p. 510), is being handled in the U.K. by Chemicals Department, Esso Petroleum Co., 36 Queen Anne's Gate, London S.W.1. C-Oil is primarily a butadiene co-polymer obtained by a controlled reaction of petroleum-derived mono- and diolefins. Modifications are made during the preparation of these polymers to give various degrees of unsaturation and properties suitable for many uses.

The relatively high degree of unsaturation of C-Oil makes it capable of being converted to hard surface films and resin-like material, either by being subjected to elevated temperatures or to normal temperatures in the presence of conventional driers.

C-Oil type MDE-1 is a viscous liquid suitable for casting or impregnating; while C-Oil type MDE-2 is designed primarily for baked surface coatings.

Low Specific Gravity

This hydrocarbon oil is practically colourless in thin films and has a slight pale amber colour in bulk. It has a low specific gravity (high bulk) and is compatible with aliphatic and aromatic hydrocarbon in all proportions. C-Oil is miscible in all proportions in such materials as VM and P naphtha and in the odourless type solvents. Compatibility with non-hydrocarbon resins and plasticisers is generally poor. Linseed and soya vegetable oils are compatible and can be cobodied with C-Oil at 500-565° C to give improved drying and chemical resistance to the vegetable oils. Lower temperatures are necessary with more reactive oils.

Surface coatings. C-Oil can be utilised as the complete vehicle for either clear or pigment surface coatings. The hard glossy surface that is produced by it is stated to offer resistance to scratching, abrasion, grease, solvents, soaps, alkalis and weak acids. Baked films have shown considerable promise, it is understood, in such applications as can coatings, primer surfacers, primers, drum linings, machinery and industrial enamels and many other types of surface finishes. Air-dried and baked films are of interest. Dryer concentrations employed for air-drying range from 0.4% lead and 0.04% manganese for clear films, to 0.6% lead and 0.06% manganese and 0.06% cobalt for pigmented films. The conventional naphthenates are satisfactory. Cobodying with 10-20% linseed or soya oil improves flexibility.

Both MDE-1 and MDE-2 will cure at high temperatures either with or without driers. Type MDE-2, however, has been developed primarily as a baking varnish. Films may be baked at 275°F or above with or without driers. Films other than black enamels may be cured at temperatures below 275°F with low concentration of dryers (0.001-0.03% Mn, and 0.01-0.3% Pb).

Thin C-Oil clear films (0.2-0.4 ml.) containing 0.001-0.01% Mn or iron dryers baked at about 380-400°F for 5-10 minutes are reported as showing good flexibility and chemical resistance. Films below 1.2 ml. thickness have excellent mar resistant properties, but above this thickness mar resistance decreases. The films also have good electrical properties. At present, though, C-Oil is not recommended for finishes requiring a high degree of exterior durability.

Other applications. Other uses of C-Oil explored to a limited extent in laboratory studies are in metal bonding, for up-grading resins, in inks, wood treating and as a linoleum binder. Esso's chemicals research division has also been evaluating C-Oil as a binder for glass-reinforced plastics pipe and glass cloth laminates.

Metal bonding. As a bonding agent for tinplate or iron, a strong bond is achieved in 5 minutes at 550°F. and in less than 10 seconds at 800°F. Short cures give a rubbery bond with about 100 lb./sq. in. tensile strength. The cured cements are unaffected by motor oil, ethylene glycol, metal polish or animal fat. The hard resinous-type bonds are unaffected by ethyl alcohol. A strong cured bond can also be obtained between other metals such as stainless steel, copper, brass, galvanised iron or aluminium. Dissimilar metals can also be bonded together and strong metal to glass seals can be made. The above findings suggest that C-Oil may find application in side-seam cements for tin cans, etc., where the stress is mainly parallel to the plane of the C-Oil bond. Its chemical resistance would also prove valuable.

Up-grading resins. Low softening-point petroleum resins can be up-graded with C-Oil. An unsaturated petroleum polydiene resin having a softening point of about 96°C heated to 240-280°C with 10% C.Oil for 3 hours resulted in the softening point being increased to 115°C without affecting resin colour.

Inks and wood preservation. Investigations have shown that convertible inklls will cure at 300°F to possess some unique and interesting properties such as good flexibility, lack of odour, and good colour retention. C-Oil impregnation of the base wood has been found to improve the life of anti-fouling paints. Used as carrier for toxic materials, it preserves the wood after anti-fouling paint has eroded away and with addition of pentachlorophenol or other suitable toxic reagents, C-Oil impregnation is stated to retard attack by marine borers.

In glass-reinforced plastic pipes, etc. In evaluating C-Oil as a binder for glass-reinforced plastics pipe and glass-cloth laminates initial work has shown that C-Oil MDE-1 provides several desirable features as a thermally setting resin for this application—low density, good electrical properties, high heat distortion and good chemical resistance. Plastics pipes reinforced with 70 to 75% of glass rovings wound circumferentially and using MDE-1 laminating binder formulation (e.g. MDE-1 50 parts by weight, vinyl toluene 50 parts, dicumyl peroxide 3 parts, and di-tertiarry butyl peroxide 1.5 parts) has been noted to have a good rate of cure at 135°C. The pipe can be removed from the mandrel after 45 minutes baking at 135°C. A secondary cure of up to 16 hours at 150°C to complete curing is then given after removal. Prepared in this fashion a pipe section with wall thickness of 100 ml. had a hydraulic burst pressure greater than 7,000 lb./sq. in.

Royal Dutch-Shell Reorganise: Stress Growing Chemical Interests

BECAUSE of the growing importance of the chemical side of the Royal Dutch-Shell organisation's business, two new subsidiaries dealing with chemicals have been formed and came into operation this week.

Two other subsidiaries, dealing with oil, came into operation at the same time.

Chemicals account for 8% of all sales by the group and have grown two and a half times in the past five years.

The new subsidiaries are Shell International Chemical Co. Ltd., in London, and Bataafse International Chemie Mij. N.V. in the Hague, for chemicals, and Shell International Petroleum Co. Ltd., in London, and Bataafse International Petroleum Mij., N.V., in the Hague, for oil.

They will take over certain supply activities and responsibility for giving advice and services to the group's operating companies. The two principal companies in the group—The Shell Petroleum Co. Ltd. and Bataafse Petroleum Maatschappij N.V.—will function mainly in a shareholding capacity.

Use of Endrin on Blackcurrants

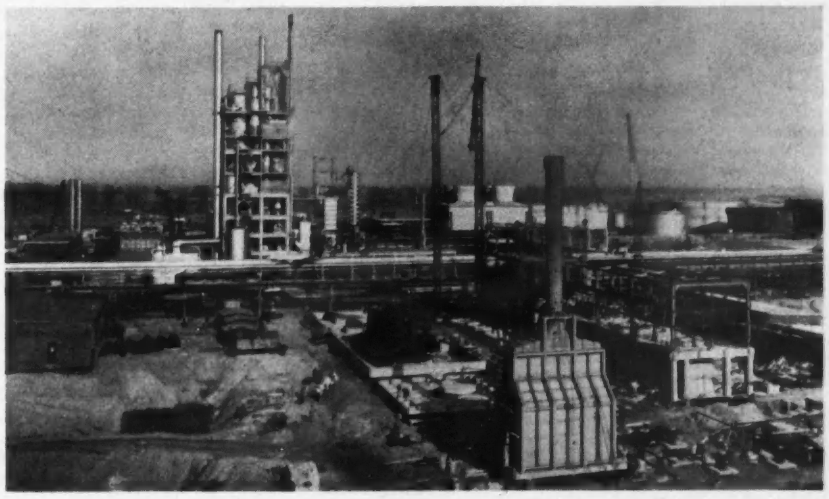
A RECOMMENDATION by the Ministry of Agriculture on the use of endrin on blackcurrants says it should not lead to a consumer hazard provided the last application is made not later than immediately before flowering.

When the fruit is grown for juice manufacture there should be no hazard provided not more than two applications each at a strength not exceeding 0.04% active material (e.g., 1½ pints of a 20% formulation per 100 gal.) are made, the first before flowering and the second as soon after flowering as possible. Pomace from the crop should not be used for human consumption.

The use of simazine on any crop should not present any hazard.

ERDÖLCHEMIE'S FIRST UNITS ON STREAM

First-Ever Lurgi Sand Circulation Cracking Plant in Operation



ON stream at the petrochemical plant of Erdölchemie GmbH at Dormagen-on-Rhine, near Cologne, are the first four installations. Erdölchemie GmbH was set up as an operating unit in September 1957 by B.P. Benzin und Petroleum A.G., of Hamburg—a direct subsidiary of the British Petroleum Co. Ltd., London—and Farbenfabriken Bayer AG, of Leverkusen. The first installation on stream was the olefin unit (see CHEMICAL AGE, 7 February, p. 248).

On 3 April the technical Press was invited to view these installations and CHEMICAL AGE's foreign correspondent was present at this occasion, which marked the closing of the first stage of the Dormagen building programme. The main part of the erection scheme will have been achieved at the Rhinebank site by the end of the year. Since certain new installations are involved in the plant's working, the company has waited until the efficacy of the whole plant has been proved before issuing any comprehensive information.

Both parent companies have been interested and active for several years in petro-chemical production. British Petroleum has been concerned in large-scale plants of the Dormagen type in Scotland and France, while the German concern —one of Europe's largest chemical producers and with a particular interest in synthetic fibres—has for years been concerned in important research work in this field. The two companies, each with a rather different interest in hydrocarbons, have been able to pool their extensive experience on technical, scientific and marketing problems in their new joint company.

Investment in the Erdölchemie plant has of necessity been high; in the first phase alone a total of DM.300 million (about £25 million) was needed. With the number of employees estimated at 700, this means that the cost of the plant per head of staff is in the region of DM.430,000 (about £35,835), an investment total far above what is usual in the chemical industry although the complete automation of the Dormagen plant brings the volume of employees to a little lower level than is usual in most new plants.

The situation of the new plant has been carefully planned so that the distance between supply sources and the plant and main consumers and the plant is as short as possible. Transport of raw materials, feedstuff chemicals and fuel oil is via a river dock on the Rhine side of the plant with accommodation for tanker vessels. Main consumer of the Erdölchemie products will be Bayer itself. The company has two works, one at Dormagen situated immediately beside the petrochemical plant site—which belongs to the Bayer concern—and the other near Leverkusen, which is to be fed with Erdölchemie products by an under-river pipeline system. Benzene produced at the works will be transported to the B.P. benzene and petroleum refinery at Dinslaken, where construction work is still in hand. This also lies on the Rhine near Dormagen and benzene will be transported by water. Sufficient ground has been left clear on the Erdölchemie site for further extensions, and a power station is soon to be built to serve the needs of the new plant on one part of it.

Raw Material Supplies

B.P.'s new oil refinery at Dinslaken, which when finished will have an annual throughput of 4 million tonnes of crude oil, will supply the total demand of the Dormagen plant, all of which is being handled at present by various other B.P. sources. The light benzene which will form the raw material for the plant is stored in a tank farm consisting of 5,000- and 15,000-tonne containers. To save space here Erdölchemie is building a high concrete wall around the farm; this reduces the space necessary between the tanks because of fire risk. A foam house on the edge of the farm and automatic foam distributors fitted to the tanks reduce danger from explosion and fire still further.

Feed benzene is led from the tanks for cracking into the basic hydrocarbon products—ethylene, propylene, butylene, butadiene, methane and hydrogen. Part of the feed is transformed by high-temperature processes into first-quality motor fuel, and it is this which is to be supplied back to the Dinslaken refinery.

Two cracking plants of totally different types are situated on the plant site. The cracking plant already in action is a Lurgi unit based on sand circulation which is the first of its kind in the world. With an annual benzene feedstuff throughput of 65,000 tonnes, the plant—based on a development by Bayer of an initial idea by Lurgi and built by the latter company —is said to have the advantage of a wide flexibility in its intake potential and its production of end-product olefins. The production scheme of the installation is based on the circulation of screened sand, which acts as a heat carrier, at temperatures of from 700 to 800°C. The benzene is cracked by the heated sand, which has an extremely long lifetime, extra-fine particles being extracted from it after attrition and replaced by a corresponding amount of fresh sand. A gas separation plant which started primary operation last October liquefies most of the gas produced by the Lurgi apparatus and breaks up the gas mixture into components in a low-temperature distillation plant built by the West German Linde's Eismaschinen concern at temperatures of down to minus 150°C.

A steam cracker of the type in service for some years at the Grangemouth, Scotland, plant of British Hydrocarbon Chemicals Ltd.—a part-subsidiary of the British Petroleum Co.—is at present being built as the other cracking installation. This will have a benzene throughput capacity of 200,000 tonnes a year. The cracker is being erected by the only British-based concern employed on con-

struction, the London branch of the U.S. Stone and Webster company.

Together, the cracking plants will have an output of some 45,000 tonnes of ethylene annually. This will be further processed on the Erdölchemie site. The first installation for the production of ethylene oxide working to a system of direct catalytic air oxidation has recently started operation; a second plant of the same type will, when it is opened, bring the Dormagen plant's ethylene oxide production capacity to 36,000 tonnes annually. The ethylene oxide itself will be further processed in the Erdölchemie plant to other products. Fed to a glycol plant, it will be processed there into mono di- and triethyleneglycol, all used in the production of anti-freeze products, synthetic fibres and, like ethylene oxide itself, plastics. The glycols plant has been built by Bayer, which will take most of its products.

Apart from the ethylene oxide, the ethylene produced will also be used in the production of ethanol (synthetic alcohol). Plant for this is at present being built. It will have a final capacity of 18,000 tonnes annually. The ethanol produced will be sold to the German Federal Monopoly which covers technical alcohols.

Of the propylene produced, a large part will be processed into propylene oxide—another Bayer-built installation with a primary annual production capacity of 20,000 tonnes. Most of the propylene oxide produced will be further processed at Farbenfabriken Bayer, Leverkusen, under a new Bayer production metaod for special foam plastics. Extension of the present propylene output facilities has begun already at Dormagen.

Planned for future construction as part of the Erdölchemie plant are installations for the separation of C_4-hydrocarbon mixtures formed of butadiene, n-butenene, isobutylene and small quantities of butane and isobutane. In the foreseeable future the plant will have an output capacity of 30,000 tonnes annually of butadiene for these installations. The greater part will be sold to Bayer for the production of such synthetic rubber types as "Perbunan-N" and most of the rest to Bunawerke Hüls, of Marl, West Germany, for its 'cold' synthetic rubber production. The isobutylene output will either go to the motor-fuel industry after polymerisation as the so-called 'polymer-benzene' or be split by distillation processes into di- and tri-isobutylene as raw materials for the detergent and disinfectant industry.

Of the by-products, the benzene is, as stated above, sent back to Dinslaken, the fuel oil is used in Erdölchemie's own boilers and the crack gas is processed for the extraction of hydrogen (which is used for hydrogenation purposes). Later the crack gas will be processed into synthesis gas, to be used as raw material for manifold chemical uses; at present such of it as is not used is burned in the boilers of Bayer's Dormagen plant.

Also on the Erdölchemie plant site are staff accommodation units, a branch plant of the Knapsack-Griesheim concern for the production of such nitrogen as is used as an inert gas by the plant s installations and a decontamination plant for the treatment of effluent water to be pumped into the Rhine.

By the end of this year there are expected to be four more installations on stream at Dormagen in addition to the four at present in full operation. Now, as in the future, sales generally will be of such products as are not required by Bayer, the main customer.

Worboys of I.C.I. says "We Under-Estimate the Importance of Selling"

THE publicity budget of Imperial Chemical Industries Ltd. is rather more than £3½ million a year, Sir Walter Worboys, commercial director of I.C.I. said at the Advertising Association's Annual Conference on 3 April. Of this, £3 million is for product publicity and less than £600,000 for company publicity. A quarter is spent on advertis.ng overseas. On the subject of selling raw materials Sir Walter declared: "We underestimate the importance in our national life of the skills which are called for in selling the output of our factories." We no longer have a sellers market, he said, and many of the younger executives in British industry never knew strongly competitive conditions until 18 months ago.

Four essential requirements suggested by Worboys for the health of British industry were: good research, good techno.ogy, good personnel policies and good commercial exploitation of products. Without these, he said, we will not 'go places'.

Newer and more complex products such as plastics and synthetic dyestuffs required good selling because price was not the only factor determining their sales. To get the best results properties and methods of use have to be carefully explained to the customer.

Sir Walter said advertising was a valuable tool which, intelligently used, could enable one salesman to do what, without it, would take more than one salesman. It should be used not only to encourage immediate sales but for development purposes.

"If we are to continue to export, we must develop new products and new grades of existing products," he said. "Selling requires imaginative thought. The amount and calibre of the competition we have to meet is increasing." Sir Walter concluded: "We live in fast times; one has to run fast to stay in the same place; one has to run very fast indeed to get anywhere."

William Edge's Extension Plans

William Edge and Son, Ltd., chemical manufacturers, have had plans prepared for the erection of an extension to their factory in Raphael Street, Bolton, Lancs.

Open Days at Coal Research Laboratories

ON 22 April, British Coal Utilisation Research Association celebrates the 21st anniversary of its foundation. To mark the occasion the association is throwing its laboratories open to inspection for three days, from 22-24 April inclusive. On the 22nd, which is to be a private members' day, the proceedings will be opened by Lord Mills, Minister of Power. On the afternoon of the 24th the London section of the Royal Institute of Chemistry will be visiting the research station as part of its tour of research organisations in the Leatherhead area.

A limited number of applications to visit the laboratories on the open days may still be considered. Applications should be made to the Assistant to the Director General, B.C.U.R.A., Randalls Road, Leatherhead, Surrey.

£1M Dow Agrochemicals' Factory

Dow Agrochemicals Ltd. have begun preliminary work at King's Lynn, Norfolk, on a £1 million factory for the manufacture of agricultural chemicals.

The factory will concentrate at the outset on the manufacture of a selective weedkiller of couch and other grasses, reeds and bracken, under licence from the Dow Chemical Company of America.

(*Continued from p.* 611)

European Free Trade Area or Common Market?

which would amount to about £100 million of business by 1970. Not only would the chemical industry be affected, but also other industries which used chemicals at some stage in manufacture of their goods. He did not wish the industry to be depressed, however. The failure of the F.T.A. talks had possibly been associated in part with France's Algerian problems, and with Germany's East Berlin situation. No renewed negotiations were expected for a year or two, however.

Being prepared was most likely to lead to success and to the U.K. establishing herself in the Common Market. To do this, low cost raw materials were required, quick deliveries of orders, regular supplies of chemicals etc., to Europe (not merely when surpluses were available), bulk deliveries, adequate packaging, technical services for products, etc., and publicity. New discoveries, Mr. Edwards stressed, should be brought into production as soon as possible in order to provide valuable royalties on which there were no tariffs.

Approximate Level of Ad Valorem Duties, Common Market

	U.K.	1957	1970
	%	%	%
Fertilisers	20	0–30	10
Dyestuffs	33	0–30	18.5
Plastics	10	3–30	20
Organic chemicals ...	33	0–30	18
Inorganic chemicals ...	20	0–30	14
Pharmaceuticals	10–33	0–25	18

EXPERIMENTAL VINYL MONOMERS FROM GAS MIXTURES OF LOW ACETYLENE CONTENT

LABORATORY- and pilot-scale production of vinyl monomers from gas mixtures of low acetylene content is described by Georg Thurzó, of the Budapest Research Institute for the Organic Chemicals and Plastics Industries (*Chemische Technik*, February 1959). Thurzó states that after it was found possible to produce large commercial quantities of acetylene from natural gases, experiments were begun to utilise these gases—which have a relatively low acetylene content of between 7 and 8% (**1,2**) directly for chemical synthesis, with the production of vinyls in mind. The Budapest Institute therefore set out to discover the optimal conditions required for formation of vinyl chloride and how to so arrange its production from the starting gas mixture as to leave the CO_2 and the H_2 content of the mixture free for further use.

Aside from the main reaction occurring when hydrogen chloride is added to acetylene, the following reactions have to be taken into account:

i $CH = CH + HCl \longrightarrow CH_2 = CHCl + 22.818$ kcal

ii $CH = CH + 2HCl \longrightarrow CH_3CHCl_2 + 39.188$ kcal

iii $CH_2 = CHCl + HCl \longrightarrow CH_3CHCl_2 + 16.370$ kcal

On the basis of thermodynamic research in this field (**3,4**) all the properties of the catalysts, in which mercury chloride mainly acts as active component, the following main considerations were reached:

Main Considerations

1. As both main and subsidiary reaction are strongly exothermic, reaction heat must be drawn off quickly. A longer life for the catalysts may be attained by a cooling effect of the large quantity of inert gas present.

2. The presence of inert gas decreases the calculated conversion rate for acetylene.

3. The excess of hydrogen chloride is advantageous not only for the main reaction but also for the subsidiary reaction

Many authors have dealt with the properties of the catalysts formed from activated carbon as carrier and mercury chloride as active component (**5-12**). The report mentioned under footnote 1 (Lynn & Kobe) deals with the production of vinyl chloride from gas mixtures with low acetylene content; for the synthesis activated carbon with 17.5 weight % $HgCl_2$ and 17.5 weight % $BaCl_2$ were used as catalyst in this case. This separation of the vinyl chloride from the gas mixture was not investigated.

Laboratory experiments were carried out with a gas mixture of 8% acetylene, 25% CO, 4% CO_2, 53% H_2, 1% air and 9% HCl. As it had been shown that methane would have no effect on conversion carried out under the determined temperature limit of 200°C, no methane was present in the mixture. The catalyst was made up of activated carbon plus 10 weight % mercury chloride and 20 weight % titanium dioxide. (**13,14**) Using this catalyst, a complete conversion may be obtained at 120°C with the usual spatial velocities. The catalyst of the West German concern A. Wacker AG, as modified by Kobe, was tested as comparison.

In Thurzó's experiments acetylene, H_2, CO_2 and CO were first purified by the usual methods. Hydrogen chloride used was taken from technical hydrochloric acid with sulphuric acid, drying being effected by washing with concentrated sulphuric acid. A membrane-operated apparatus specially designed in the same laboratory served to control the gas mixing and the flow quantity.(**15**) The laboratory reactor was an iron pipe, fitted with heating jacket, 1,500 mm. long and 1 in. diameter. Placed in the middle of this pipe was a ¼ inch-thick tube with three thermo-elements. The conversion rate was determined by analysis of the gas mixture as it entered and as it left the reactor, by quantitative determination of the acetylene as a copper acetylide. H_2 and CO were checked by a smoke-gas analysis apparatus fitted up for determination of the end gases, and it was found that both gases remained completely unchanged during the formation of the vinyl chloride and were of use for further syntheses with no loss at all.

Experiments were carried out with two catalysts—that used by Kobe and Lynn (see above), with its 17.5 weight % as promoter, and that of the Budapest Institute's own primary experiments (see above), in which the 20 weight % of TiO_2 acted as promoter. The second was highly advantageous at lower temperatures.

Hungarian Catalyst

Scientific literature states that a specific production of 20 to 40 g. vinyl chloride /l catalyst /h may be achieved, some patents, and that mentioned under footnote 6 quoting much higher figures. The catalyst is generally changed when the conversion rate falls below 95%—this is usually after 1,000 to 3,000 hours of operation. The Hungarian Institute has attained, in its catalyst fatigue experiments, a specific production of 48 to 49 g. vinyl chloride /1 catalyst /h, with a temperature of 120°C and a spatial velocity of 182/h. In the discontinuous working undertaken the Hungarian catalyst had a life varying from 120h per 100% conversion per 49.5 g. specific production to 1,300h per 80% conversion per 38 g. specific production. These figures would improve with use of a continuous system. Lowering of the acetylene conversion rate is disadvantageous, as recirculation of low acetylene content gases is impossible, so all acetylene not converted into vinyl chloride is lost.

Separation of the vinyl chloride could be achieved by low temperature condensation, by absorption with use of the necessary solvent and by adsorption with activated carbon. After research into all three methods, the Institute decided to use the last-named method—its experimental production installation is a discontinuous process and comparing its results against the potential of the two other methods.

The experimental production installation was started in 1956 on a 700-hour discontinuous system, each working period of between 100 and 200 hours. The starting mixture's components were produced and purified by normal methods, and as in the laboratory production a membrane regulating system was used for mixing and flow control. The reaction furnace was a pipe reactor with circulation heating; in each of the three catalyst tubes was placed a centre tube for four movable resistance thermometers and two thermo-elements. The volume of the catalyst inserted was 32 l. The end gases were led to adsorption towers after drawing-off of excess hydrogen chloride and drying with caustic soda, the towers each containing 10 kilograms of activated carbon. Control of the adsorption process was possible by temperature measurements by thermometers every 15 cm. and in contract with the carbon. The subtracted adsorber was drawn off, the vinyl chloride blown by steam to a gasometer and first dried and then liquefied. The composition of the adsorber's entry and exit gases was analytically determined. The adsorber was treated with pre-warmed hydrogen before the start of a new working period. Production of vinyl chloride in this installation confirmed the results obtained in the laboratory experiments, although separation of the vinyl chloride was less successful, probably due to insufficient drying of the carbon in the plant.

The success in this field has led the Institute to start work on the direct synthesis into vinyl acetate of the gas mixture resulting from the partial oxidation of methane; separation of vinyl acetate is much simpler than that of vinyl chloride, it is stated.

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Will

MR. EDWARD GREGORY, Bolton, Lancs, head of the buying department of Wigglesworth Ltd., chemical manufacturers, who died on 28 September 1958, left £22,596 8s. 6d. net.

B.D.H. Indigo-Carmine Method for Determining Dissolved Oxygen in Boiler Feed Water

DETEKMINATION of oxygen in boiler feed water is of growing importance and British Drug Houses Ltd. have by suitable modifications enabled the accurate and simple method based on the change in the yellow colour of indigo-carmine to be reduced with glucose through orange, pink and mauve to blue in the presence of increasing quantities of oxygen in low concentrations (up to 0.12 ml. of dissolved oxygen per litre) (1) to be used for this purpose

The modifications have been made by the Alfloc water treatment service of Imperial Chemical Industries Ltd. (2) who have assisted and advised in matching the colours of the standard disc now available for the test.

Samples of water for test are taken in a specially modified Nessler cylinder containing a small tube, which holds the reduced indigo-carmine reagent, attached to its inside wall. The small tube is closed by a glass ball. When the sample has been collected the Nessler cylinder is immediately sealed with a glass stopper, and then inverted so that the glass ball falls from the inner tube and the reagent flows into the water. The cylinder is inserted into the B.D.H. Lovibond Nesslerliser for colour matching.

Nickel, cupric or zinc ions in concentrations of 1 p.p.m. and ferric ion at 3 p.p.m. cause no interference. No serious interference has been found to occur from either sulphite or hydrazine in the low concentrations normally present in boiler feed water.

The test requires the following: the standard disc NOE which covers the range from 0 ml. to 0.12 ml. of dissolved oxygen per litre (nine steps); reagents are indigo-carmine/glucose tablets, potassium hydroxide solution and Glycerol 'Analar'. Each indigo-carmine tablet contains 0.018 g. of Edicol Supra Blue XS (indigo-carmine) and 0.2 g. of glucose AnalaR. The tablets (Code No. AS.020) are issued in tubes of 50). The potassium hydroxide solution is prepared by dissolving 51.5 g. KOH AnalaR in enough water to give 100 ml. of final solution (37.5 g. KOH in 100 g. of final solution). The prepared reagent can be obtained in 100 ml. flat polythene bottles. The method and procedure to be employed are given in the B.D.H. leaflet LNDO (IC)/9/5901.

p-Dimethyl-amino-benzaldehyde. Prepared specially for hydrazine determinations is p-dimethyl-amino-benzaldehyde. The acid salts of the azine which is formed by the reaction p-dimethyl-amino-benzaldehyde with hydrazine are intensely red in strong solutions and yellow in dilute. Intensity of colour, it has been observed, is not affected by other reducing substances. The procedure, developed by Pesez and Petit (3) has been further developed by Watt and Chrisp (4) into an accurate spectrophotometric method for determination of hydrazine in the presence of urea and semicarbazide, and an application of the method to the colorimetric determination of hydrazine in boiler waters is described by the American Society for Testing Materials Designation D 1385-55T:—

This reaction can also be applied to the determination of substances from which hydrazine can be liberated by conventional chemical methods, e.g. determination of maleic hydrazide in plant and animal tissue.

The material offered by B.D.H. Laboratory Chemicals Division, Poole, Dorset, is a pale cream to buff crystalline solid, with a melting point of 73 to 75°C. Another new entry in the B.D.H. catalogue is carboxy-methyl-cellulose sodium salt.

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New Process Eliminates Cyanide Fumes

JUST patented in the U.S. by Pittsburg Coke and Chemical Co., is a process for getting rid of by-product cyanide fumes formed during ferromanganese production. The process is described as a much modified, continuous wet-wash system with pH the critical factor, which is economic both as regards initial equipment outlay and operating costs. Total monetary outlay is reported to be $150,000 compared with $2.5 million for the dry electrostatic precipitation route; while the clean gas produced can be used to preheat furnace blast and boilers. Production costs are thereby reduced and ferromanganese recovery is reported to be increased.

Usual wet-wash methods for ridding fumes of cyanide salts (mostly potassium, some sodium) were estimated by Pittsburgh Coke to cost about $1,200 a day for a single furnace, because of the high cost of chlorinating the wash water. Also, the wet system produces a gas that is 'cementaceous' (when lime present in the gas meets water a cement-like calcium carbonate deposit forms on process equipment and clogs the system).

Besides the initial cost disadvantage for the dry electrostatic precipitation method, there are handling and storage problems, and the process does not clean up the gas satisfactorily enough for it to be used in boiler heating.

In the Pittsburgh Coke patent, the innovations are a redesigned wet venturi fume scrubber (designed by Pittsburgh and constructed by Chemical Construction, U.S.) and a water circulation control system. A dust catcher, a cooling and stripping tower, and a Dorr thickener are also used.

The gas stream first passes to the dust catcher, where velocity reduction and change in flow direction cause deposition of larger particles. A 3.5 p.s.i. head on top of the furnace forces the gas through the venturi at velocities between 200 and 400 ft. per second. (In the redesigned venturi, jets of relatively low pressure water, relocated on top of the venturi, put a water blanket over the inside surface, eliminating wet-dry lines.) Dust content is reduced from 10 to 0.002 grams per cubic foot. The gas then expands as it passes from the 6 ft. diameter lead-in pipe to the 18 ft. diameter cooling and stripping tower. It is then refrigerated, rises through the tower, and passes to the furnace stoves and boiler room.

Spent scrubbing water containing alkali cyanides, hydrogen cyanide and dust particles flows from the tower to the Dorr thickener. Here hydrolysis occurs with production of potassium and sodium carbonates and hydrogen cyanide. The solids settle out and are either recharged to the furnace or stored for future use. The hydrogen cyanide is given off from the thickener to atmosphere at a rate proportional to the pH. Optimum pH is reported to be 10.5.

One part of the overflow water from the thickener goes to the venturi where it comes in contact with the raw furnace gas. The pH rises and hence so does the water's affinity for hydrogen cyanide, leaving a much purified gas to pass to the burners and boiler room. Hydrogen cyanide build-up in the water is overcome by pumping the remaining thickener overflow to the cooling and stripping tower where it meets the purified gas, lowers the pH, so releasing more hydrogen cyanide to the gas stream. The pH of the thickener is important, for if it is too low, the floc does not precipitate.

A similar gas-cleaning system has been installed for the company's malleable iron furnace with the system emptying into the one thickener. The carbon monoxide and carbon dioxide content from the malleable iron furnace help in maintaining the required pH for the thickener.

Six-lecture Course on Analysis of Plastics

A short course on the analysis of plastics will be held at the National College of Rubber Technology, Holloway Road, London N.7, on Wednesday evenings beginning 29 April. Subjects are an introductory survey, infra-red spectroscopy, characterisation of flexible materials, applications of modern methods of analysis, and analysis of surface coatings. Fee for the course is £1 2s.

I.CHEM.E. SYMPOSIUM ON FLUIDISATION—3

Dorr-Oliver Project Engineer Discusses Thermodrying in Fluidised Beds

HANDLING of granular materials in fluidised beds, and the removal of surface moisture by thermal vaporisation, at temperatures below the boiling point of the liquid associated with solids being dried, and if required the removal of the water of crystallisation, at the temperature of dehydration, was considered by D. W. Beeken, project engineer, Dorr-Oliver Co. Ltd. ('Thermodrying in fluidised beds').

Particle size distribution of the materials should be such as to fluidise readily. To ensure this, maximum particle sizes could be as much as 1½ in., or even more, but in general, about ¼ in. dia. should not be exceeded. The particle size range should be wide and distributed over no less than four consecutive Tyler screen sizes, i.e., a four-fold diameter variation with a fair proportion of fines.

Dorr-Oliver's FluoSolids system was described by Beeken. Applied to a variety of materials it had effected moisture removals of from 2 to 30% of the feed. Because of the large volumes of gases employed, however, it could not deal effectively with fine powders without exceeding economic limits in equipment size. Drying of calcium carbonates in various forms had proved particularly adaptable to the system, it was claimed; blast furnace slags, clays and coal had also been dried successfully.

Drying Dolomite

Drying either dolomite or limestone by means of a FluoSolids system was detailed. One such system handled 85 tons of minus ¼ in. limestone per hour and had successfully dried material as coarse as ¼ in. Moisture was reduced from 3% to virtually 0% and a three-stage cyclone system recovered dust in the 3 to 5 micron range.

An unusual unit which had been in operation almost a month was drying an extremely corrosive chlorinated hydrate at a U.S. chemical plant. Because of the nature of the substance special materials of construction were required and the reactor itself was lined with glass rather than the usual brick. Moisture content of 500 lb. per hour was reduced from 30% to about 0.5%.

During recent years a number of tests on the fluidised drying of phosphate rock had been carried out at Dorr-Oliver's Westport Laboratories, Beeken announced. Testing with small-scale units had shown conclusively that pebble rock as well as spiral and flotation concentrates could be successfully handled in single units capable of treating as much as 300 tons per hour.

In the U.K. the first FluoSolids dryer, recently commissioned, was being used to dry a raw clay carrying some 3½ to 5% surface moisture and of a particle size of which some 97% was between 6 and 85 B.S.S. mesh. Designed to handle 10 tons per hour of feed the unit had two fluidised beds arranged in series in which the upper bed used as a solids preheat bed also drove off the surface moisture. The lower bed was designed to operate continuously at 450°C. The process demanded non-oxidising conditions, in the lower bed, so excess air was not used for tempering the flue gases.

From the start the dryer worked well with no fluidisation, transfer tube or discharge troubles but, intially, condensation took place, sufficient to enforce a shut down, and the feed by-pass was not as successful as had been hoped. The condensation, it was believed, was due to incomplete lagging of the cyclones and hopper. With completion of the lagging and the use of heated air to fluidise the FluoSeal (which discharges the cyclone dust at the base) there had been no recurrence of that trouble. A secondary cause was thought to be due to the eagerness to commission the plant and the charging of the beds initially with raw feed starting with the bottom bed before charging the top bed, and that some of the moisture found its way to the cyclone hopper which was not then lagged. This plant was attended by a single operator on each shift.

Other papers presented at the North-Western I.Chem.E. branch in the 'Fluidisation Symposium' were reported in *Chemical Age*, 28 March, p. 537 and 4 April, p. 577.

Experimental Work on the Rise of Bubbles in Fluidised Beds

VERY few studies have been reported in the literature in which any attempt was made to investigate specifically the rate of rise or size of bubbles formed in fluid beds. The paper by J. F. Davidson, R. C. Paul, M. J. S. Smith and H. A. Duxbury was an attempt to remedy this deficiency and measurements of the rate of rise of air bubbles in a bed of particles fluidised by air were described

Rate of rise of a bubble in an air-fluidised bed of particles was measured by observing the time internal between the release of a shot of air injected at the base of the bed, and its arrival at the surface as a bubble. The main air supply was just greater than the minimum rate for fluidisation.

In the results obtained it was observed that the velocity of the bubble did not vary as the bubble rose. It was also suggested that there were errors in the timing devices used. This, of course, could occur through a time delay between marking of the injection time and complete formation of the bubble. Also the bubble would take a little time to accelerate. The particles, too, on the surface of the bed might be disturbed somewhat before the bubble finally reached the surface.

Values obtained of $U\infty/V\frac{1}{6}$ strongly suggested that air bubbles in a fluidised bed are of the spherical cap type. It is believed that such a rising gas bubble would push aside the particles in its track. Also in the same way as with air bubbles in a liquid, the bubble would carry with it a wake of particles. This would explain, these workers stated, the satisfactory mixing characteristics of a bubbling, or aggregative, fluidised bed. The fact that the air bubbles appear to rise as spherical cap bubbles also implied that the fluidised bed has zero surface tension and viscosity.

Another striking result reported of the spherical cap behaviour was that the rate of rise of a gas bubble in a large bed should be independent of the particles forming the bed. This prediction was also borne out by the results obtained.

Conclusions drawn by Davidson *et al.* were that in a bed of particles fluidised by gas it appeared that a single gas bubble rose at the same speed as it would in an inviscid liquid of zero surface tension. This meant, it was stated, that the rate of rise $U\infty$ was dependent only on the volume of the bubble V and $U = 0.792\ V\frac{1}{6}\ g\frac{1}{2}$. The rate of rise appeared to be independent of the air rate for fluidisation, and of the density or size of the particles, but it was suggested that further experiments were desirable, with a wide range of particles of different materials.

The above conclusion showed that, as far as bubbles were concerned, the fluidised particles behaved like an inviscid liquid of zero surface tension. Conclusion one also suggested that the gas bubbles were true voids, containing few particles. It seems likely, however, that although each void rose as an entity, the void might not always contain the same gas, so that bubbling might not necessarily lead to by-passing of the particles by the gas.

SYMBOLS

$U\infty$ = estimated rising velocity in a large bed (cm./sec.)
Vz = volume of bubble (cc).

Obituary

SIR ASHLEY S. WARD, LL.D., died on 26 March, at the age of 81, after a short illness in a London hospital. He was president of Thos. W. Ward Ltd., Albion Works, Sheffield, chairman of the Park Gate Iron and Steel Co. Ltd., Rotherham, and vice-chairman of Laycock Engineering Co. Ltd., Sheffield. A nephew of Thomas W. Ward, the founder, he joined the firm as a young man.

Chemist's Bookshelf

GASES AND LIQUIDS

PROPERTIES OF GASES AND LIQUIDS—Their Estimation and Correlation. By *R. C. Reid* and *T. K. Sherwood*. McGraw Hill Book Co., London, 1958. Pp. xii + 386. (77s. 6d.)

Perhaps the feature which more than any other distinguishes the chemical engineer from his colleagues in other branches of engineering, is his need to command a knowledge of the properties of a very wide variety of materials, or, more generally, to be able to predict physical properties of the materials which he may be called upon to process. He is concerned in his alternative role as process engineeer particularly with the properties of fluids and their behaviour when subjected to pressure, changes in temperature and changes of phase.

There is, of course, a voluminous section of the literature dealing with such properties, perhaps the finest collection in book form being in the International Critical Tables, and a good deal of present-day journals is taken up with articles extending this knowledge. However, in several fields of chemical engineering, of which perhaps distillation is a notable example, it is true to say that design calculations are limited more by lack of knowledge of physical properties of the materials being processed than by any other single factor. Moreover, it is a common experience when one comes to look up properties of the materials involved in a new problem on which one is working to find little information in the literature on these properties, or else to find that what published information there is does not cover the range of conditions in which one is interested.

Critical Survey

The present volume is, therefore, likely to be particularly valuable, providing, as it does, a critical survey of the methods of prediction and estimation of the properties of gases and liquids which are of especial interest to chemical engineers. This book is much more, however, than a collection of formulæ and methods since it bases the methods suggested on thermodynamic considerations as far as is possible. It could be said, in fact, to be an excellent text in applied thermodynamics, which could be used with advantage to illustrate to the student the use of much of the material which he has to read in this subject and which, without application, often appears meaningless.

The book commences with a survey of critical properties of fluids with a number of useful tables of group contribution values. Then follows a section on pressure-volume-temperature relationships which are developed and continued in the subsequent chapters dealing with vapour pressures, latent heats, heat capacities, heat of formation and combustion, and free energies. The next three chapters deal with viscosities, thermal conductivities, and diffusion coefficients, and the last chapter is an extensive survey of vapour liquid equilibria phenomena and prediction of relationships both for binary and ternary systems.

A very fine bibliography is included containing almost 500 references, although the English reader will no doubt regret that an appreciable proportion of these are to publications of American institutions which are not readily available in this country.

A valuable feature of the book is the comparison of the accuracy of prediction of the various methods considered and the critical consideration of the values and range of applicability of these techniques

This book is likely to be a most valuable supplement to handbooks of published data, tables of physical properties, and the like, and should prove very valuable to the practising chemical engineer. It is also to be welcomed by the teacher in providing very many additional examples of the application of thermodynamics, so that the student is more easily made aware of the importance of this particular branch of the science.

D. C. FRESHWATER.

Collection of Essays on Periodic Table

THE PERIODIC TABLE. By *D. G. Cooper*. Butterworths Scientific Publications, London. 1958. Pp. ix + 86. 6s. 6d. (post 1s. extra).

Professor C. E. H. Bawn writes the Foreword to this small book on the Periodic Table, written by D. G. Cooper, head of the science department, Birkenhead Technical College. Professor Bawn emphasises that it is important that the modern student should appreciate and understand at an early stage the framework within which his subject is built rather than be overburdened with factual information. Mr. Cooper has, therefore, in presenting a concise and readable account of the Periodic Table and its application, done a valuable service to inorganic chemistry.

The present work is offered as a collection of essays on the Periodic Table explaining, and explained by, the atomic theory. No attempt has been made to make the treatment comprehensive. Relatively few facts have therefore been selected, but these have been carefully deployed. After individual treatment of the groups, there is an account of the Periodic Table as a whole followed by sections on a few special topics such as electropositivity, transition elements, and the actinons, including the transuranic elements. A bibliography and an index are included. Students at the advanced level in grammar schools and first year university and Higher National Certificate students should find this book ideally suitable.

D.L.M.

Efficient Use of Fuel Revised

THE EFFICIENT USE OF FUEL. 2nd Edition. H.M.S.O. London. 1958. Pp. 888. 35s. net.

The first edition of this book achieved a well-deserved reputation in spite of the fact that it was prepared hurriedly under wartime conditions and that it was a compilation of the work of many contributors. The aim of the book was to emphasise "the application of knowledge" and to disseminate information on efficient methods of using fuel. The 2nd Edition, which has been awaited for some time, is considerably improved. Coal classification is now dealt with in Chapter 2 where the Seyler, National Coal Board (revision of 1956) and Economic Commission for Europe, classifications are described. The Seyler coal chart is, incidentally, based upon the carbon and hydrogen contents of the coal expressed on Parr's dry mineral-free basis and not on the dry ash-free basis as stated in the book.

Chapter 6 on 'The Chemical Principles of Combustion and Gasification' has been rewritten and combustion calculations are now worked out on the mol basis—a decided improvement on the earlier treatment. New material has also been provided on water-tube boilers, boiler auxiliary plant, the cyclone furnace and other furnaces, the theory of drying and on instrumentation. The chapters on 'Heat Transmission' and the 'Flow of Fluids' have been completely rewritten.

Particularly useful are the chapters dealing with furnaces and boilers and with heat balances, but treatment of gasification is brief. Gas producers are discussed in Chapter 18, from the practical standpoint but the student will have to go to other sources for an adequate discussion of gasification processes. Apart from a brief mention, carbonisation processes are not discussed. However, the book is intended for the fuel user rather than for those employed in the fuel industries.

The book is well-provided with illustrations and useful references are given at the end of each chapter. Many of these are to British Standards and Codes of Practice where these are appropriate. Appendices give information on units and conversion factors, statistics of fuel and energy resources and consumption, together with production figures for British coalfields; steam tables and a useful index are provided.

It is certain that this book will be widely used not only by students in technical colleges and universities but also by practising engineers and fuel technologists. It should prove of even greater value than the first edition.

R. LONG.

Guide to W. German Chemical Industry

TRADING DIRECTORY OF THE CHEMICAL INDUSTRY IN THE FEDERAL REPUBLIC OF GERMANY AND WEST BERLIN. Edited by *Dipl. Ing. H. Wegner.* Econ-Verlag GmbH, Dusseldorf. 1958-59. Pp. 670. £4 15s, DM. 48 or $12.

Incorporating Wenzels Directory and Commodity Guide, this directory, published in conjunction with the Association of German Chemical Manufacturers, is the only official and comprehensive trade directory embracing both companies and products, and follows the amalgamation of the former two recognised manuals. It is divided into four sections—list of companies, local index, list of products, and registered trade names.

More than 3,200 chemical manufacturers and commercial concerns are listed alphabetically in the list of companies, together with full addresses and details of supply programmes. All companies contained in the alphabetical index have been listed according to town and district —a valuable aid to both foreign and domestic buyer.

The list of products contains manufacturers of each individual product of all German concerns located in West Germany and in West Berlin together with the respective commercial companies. More than 10,000 headings are included.

Some 4,000 registered trade names are recorded forming the most comprehensive list so far published for Western Germany. Details of the products supplied by the manufacturing companies are given.

Products and indexes are translated into English, French, and Spanish, so facilitating use by foreign companies.

Sima Directory of British Instruments

WORLD-WIDE distribution of the latest edition of 'British Instruments—Directory and Buyers' Guide' is being arranged by the Scientific Instrument Manufacturers' Association. The book has just been published in co-operation with Sima by the United Science Press Ltd., 9 Gough Square, London E.C.4, price £2 2s.

In its 600 pages, the directory has a four-language scientific instrumentation glossary in French, German, Spanish and English. Instruments and components featured in a classified list number 2,500 and cover the following main fields: measurement and control of temperature, pressure, humidity, flow, weight, texture, dimensions, inspection and gauge testing, data processing, optics, microscopy, physics, mechanics, pneumatics, analysis, atomics, electronics and nucleonics.

Other sections of this compact and convenient guide to what British manufacturers can produce in the field of instrumentation for science and industry include a list of allied associations, British Standards Specifications, consultants and engineers for instrumentation schemes, manufacturers of prototypes and small batches, manufacturers' addresses and selected trade names.

Chemist's Bookshelf

CHEMISTRY OF DRUGS

THE CHEMISTRY OF DRUGS. By *Norman Evers* and *Dennis Caldwell*. Third edition. Ernest Benn Ltd., London. 1959. Pp. 415. 84s net.

THIS new edition of Dr. Evers' book of the same title, in which he has had the collaboration of Mr. Caldwell, is completely rewritten and considerably expanded to to justice to the spate of synthetic drugs which has arisen since the last edition appeared.

The 18 chapters comprising the first part of the book cover synthetic chemicals arranged according to their pharmacology or their clinical uses. The bulk of this part treats of hypnotics, analgesics, anaesthetics, sympathomimetics, antispasmodics, autonomic blocking agents and antihistamines—the regular stock-in-trade of the modern physician—while a chapter on transquillisers (rather a mixed bag from the angle of the chemist) serves to acknowledge their mushroom-like growth in the field of contemporary medicine. The second part deals with naturally occurring drugs arranged according to their source, or, failing that, their chemical and pharmacological affinities. The official or approved names of drugs are listed in two appendices against proprietary equivalents and systematic chemical names.

Each chapter gives an introductory review of the synthetic history and structural relations of the group of drugs concerned, and it is helpful to have some indications of the cross-relationships in chemical structure of drugs used for widely different purposes, such as tranquillisers and anticholinergics. Alternative syntheses and the general properties of the drug form the main substance of each monograph. A substantial bibliography rounds off the chapter.

Selection of drugs is reasonably up to date. There is a fair proportion of very recent newcomers—for instance, glutethimide, chlorothiazide, bemegride and amiphenazole—while the text has been pruned to manageable dimensions by omitting many of the older drugs now largely fallen into disuse. It is a pity, perhaps, that such important contemporaries as warfarin-sodium, cartimazole, sulphamethoxypyridazine and triamcinolone appear only in the appendices, but complete comprehensiveness in a book of this size and format must always be unattainable. It should be pointed out that narcotine is now officially dubbed noscapine, and is in fact used as an antitussive with some success. There are a few obvious errors which have crept in. Trasentin in the text might better appear as adiphenine, which, in Appendix II, should correspond with Trasentin, not Trasentin-H (which is the hexahydroderivative). An unfortunate misprint on p. 370 has duplicated the entry for amiphenazole and brought it level in the list with Paramisan, to which it bears no relationship. But these are minor blemishes on the face of a remarkable achievement.

The text is well spaced, lucidly arranged and subdivided. It is lavishly enriched with structural formulae and graphical synthetic sequences. The binding is modest, strong and serviceable, as befits a book which must by its very nature occupy an unique and essential place on the library shelf of everyone who is concerned with the synthesis, analysis or handling of drugs.

PETER COOPER.

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Chemist's Bookshelf

Theory of Organic Chemistry

THEORETICAL PRINCIPLES OF ORGANIC CHEMISTRY. Volume II. By *Professor W. Hückel*, translated from the 7th German Edition by *Professor F. H. Rathmann*. Elsevier Publishing Co., Amsterdam, 1958. Pp. xi + 1,046. £4 15s.

Theoretical considerations in the realm of organic chemistry are a comparatively new development of the subject when one considers the age of this branch of chemistry. It was clear, however, from the early studies of Lapworth, Robinson, Ingold and others, that organic chemists would eventually become very interested in explanations of the course of their reactions, and in recent years, especially since the end of World War II, great strides have been made in our understanding of the mechanism of these processes.

Professor Hückel's well-known 'Theoretische Grundlagen der Organischen Chemie' first appeared in 1931, and the present work completes the task of bringing the original up to date (Volume I appeared in 1955). Volume II contains ten chapters. The first of these is introductory in nature, with examples of the application of thermodynamics to organic compounds. Then follows a lengthy treatise on electrical properties of molecules (dielectric constant, polarisation, dipole moments, etc.). The third chapter discusses the behaviour of compounds in alternating electrical fields, including topics such as molecular refraction, dispersion, infrared and Raman spectra, rotational isomerism and anisotropism, with copious examples of the value of the study of these physical properties in determination of structure. There follows a chapter entitled "Cohesion and constitution," in which the properties associated with solids, liquids and solutions are considered (boiling points, surface tension, association, hydrogen bonds, etc.). Next comes a discourse on the orientation of molecules in the liquid and solid states, with a section on the use of X-ray diffraction methods in determination of molecular structure, and of absolute configuration of asymmetric molecules. Space is also devoted here to macromolecular compounds.

The sixth chapter covers colloids (viscosity, macromolecules, soaps), and the seventh is an excellent discussion on chemical bonds—a particularly well-written survey which leaves the reader with a clear picture of modern conceptions of the nature of linkages between atoms. The last three chapters are concerned with reaction velocities: theoretical aspects followed by a stimulating discussion of the factors which influence organic reactions, including steric hindrance, ester hydrolysis, reactions in the aromatic series (substitution, directive influences, etc., with an interesting historical survey of aromatic substitutions as a whole, which again leaves the reader familiar with modern concepts). Polymerisation and chain reactions are also discussed, and (in the last chapter) reaction velocity and equilibrium are considered side by side.

Professor Rathmann's excellent translation of this work enables it to take its place amongst the classic English treatises of physical organic chemistry. A wealth of information is presented in a most readable style and in a systematic manner, with very few errors. Extensive subject and author indexes are provided, although the compound index to Volumes I and II promised in Volume I seems not to have materialised. The tables and formulæ have been executed beautifully and the book is printed on high-quality glossy paper, and has an attractive green binding.

A. R. PINDER.

Critique of EDTA in Analysis

ANALYTICAL APPLICATIONS OF DIAMINOETHANE TETRAACETIC ACID. By *T. S. West* and *A. S. Sykes*. The British Drug Houses Ltd., Poole. 1959. Pp. 106. 4s 6d.

From its first use in water hardness determination, described by Schwarzenbach little over ten years ago, the development of EDTA as an analytical reagent can fairly be described as meteoric. Upwards of 200 original papers a year are now published on this topic and few metals in the periodic table have not been satisfactorily determined either by direct or derivative procedures. This inexpensive little book presents a very competently condensed account of a subject which has by now become extremely complex; one of its most admirable features, the result of the authors' own wide experience, is that it is not merely a compilation of methods but also a critique. Within its comparatively limited compass it includes a brief but clear account of the physical chemistry of complexones and the principles on which complexometric methods are based, a list of the more important metal indicators with notes on their range of applicability, a discussion of masking and de-masking, a series of paragraphs dealing with the determination of individual metals and anions, chapters on water hardness determination and industrial analysis, some notes on complexones other than EDTA, a table of stability constants and a bibliography containing 468 entries.

In view of its general excellence, it is the more unfortunate that the book, dealing as it does with a rapidly-expanding field, is at its publication already more than a little out of date. Although very many papers of importance have appeared during the last three years, all but a small handful of the bibliography entries are of 1955 or earlier vintage. Nor is any reference made to such important (and only comparatively recent) monographs as Welcher's 'Analytical Uses of EDTA', the English translation of Schwarzenbach's 'Complexometric Titration' and the Chemical Society's compilation of stability constants. Nonetheless, this is a book which should be on every inorganic analyst's shelf.

J. K. AIKEN.

Renaissance of Inorganic Chemistry

MECHANISM OF INORGANIC REACTIONS. A Study of Metal Complexes in Solution. By *F. Basolo* and *R. G. Pearson*. John Wiley and Sons Inc., New York. Chapman and Hall Ltd., London. 1958. Pp. 426. 94s.

In the preface to this book the two authors refer to the renaissance of inorganic chemistry which has taken place in the last two decades and the increase in research activities in this field of chemistry. The stimulation of this interest has been partly due to the widespread important developments in atomic energy, semiconductors, high energy rocket propulsion fuels and in high temperature chemistry. With the successful application by Professor Pauling of quantum mechanics to the problem of the chemical bonds which hold inorganic compounds together it seemed to the authors a suitable time to review the chemical reactions of co-ordination compounds.

It is assumed that the reader will have an adequate training in the fundamentals of chemistry, and also some knowledge of co-ordination chemistry, stereochemistry and reaction kinetics, but some introductory material is included. There is a substantial description of the theory of the co-ordinate bond in which the electrostatic approach to co-ordination compounds is stressed. There are also three chapters dealing with the reactions and stereochemistry of octahedral and square complexes. The isomerisation and racemisation reactions which the geometrical isomers of complex compounds undergo are considered, and there is an account of the oxidation-reduction reactions of co-ordination compounds.

A very large number of reactions are known in which co-ordination compounds, or metal ions which form co-ordination compounds, act as catalysts, and this aspect of these compounds has received attention from the authors. There is mention of the Ziegler catalysts which are important in the low-pressure polymerisation of ethylene. The final chapter on miscellaneous subjects deals with the absorption spectra of complex ions, ion pairs, the acid base properties of complex ions and exchange reactions.

The book presents a useful modern account of the chemistry of metallic complexes in solution.

G. S. EGERTON.

U.S. Review of Chemical Publications

CHEMICAL PUBLICATIONS. Their Nature and Use. 3rd Edit. By *Professor M. G. Mellon*. McGraw Hill Publishing Co., London. 1958. Pp. x + 327. 54s 6d.

Designed for the U.S. classroom, this third edition of Professor Mellon's book continues to maintain the standards of the previous editions. It gives an overall, balanced perspective of chemical publications of various kinds. The general outline of earlier editions has been followed and the nature of periodicals, patents, treatises and other kinds of publication remain unchanged. Some new assignments in library problems are included.

The book introduces chemistry students to chemical literature and its use. It aims, therefore, at the acquisition of the knowledge as to what essential publications exist; the development of the skill to locate desired information in such publications, and finally, emphasises the strict care required in writing exact systematic references in any bibliography.

The chapter on government publications has been reorganised. The chapter on patents is contributed by Julian F. Smith, an acknowledged expert in the U.S. patent field.

D.L.M.

Chemist's Bookshelf

ORGANIC NOMENCLATURE

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY. Nomenclature of Organic Chemistry, 1957. London. Butterworth Scientific Publications. 1958. Pp. v + 92. 15s.

This book is essentially a compilation of rules of organic nomenclature abstracted from progress reports of the Commission on Nomenclature of Organic Chemistry published during the period 1947-1955. These reports, which appeared in successive issues of the *Comptes Rendus of the Conferences of the International Union of Pure and Applied Chemistry* following the London meeting of the Union in 1947, recognised the need for extension and revision of the existing nomenclature rules. The rules which form the body of this publication were issued in 1957 by the Commission. They comprise two distinct sections of definitive rules, the first dealing with hydrocarbons and fundamental heterocyclic systems; the second (issued jointly with the Commission on Nomenclature of Biological Chemistry) with the nomenclature of steroids. A third section of tentative rules is concerned entirely with nomenclature in the Vitamin B12 field.

The rules thus set out are intended to be suitable for scientific publication ranging from textbooks to journals and indexes. They constitute recommendations for the naming of types and individual compounds. Consistent with the policy of the Union, ultimate international unity in nomenclature is the basic principle, although the avoidance of restrictive rules allows a flexible compromise with traditional usage and peculiar lingual characteristics.

The intrinsic value of the book lies in the outstandingly clear and convenient way in which the rules are set out. The rules themselves lie outside the reviewer's terms of reference, although particular sections of the book may be commended as providing a concise and clarifying summary of the principles of nomenclature at a time when guidance is urgently needed. This is particularly true of the section devoted to steroids summarising for a complex field rules based essentially on the Ciba Foundation Conference held in London in 1950.

Moderately priced at 15s. the book is attractively printed and bound. A useful bibliography is included from which, however, one might regret the omission of the valuable Proceedings of the American Chemical Society International Symposium on Chemical Nomenclature, 1951.

At a time when international co-operation in science is becoming of increasing urgency it is encouraging to be reminded that chemical nomenclature is gradually assuming the form of an international language.

J. H. TURNBULL.

May's Chemistry of Synthetic Drugs
Fifth Edition
revised and rewritten by
G. M. DYSON
M.A., D.Sc., F.R.I.C., M.I.Chem.E., F.I.I.S.

The fifth edition of this work has entailed complete rewriting of all sections. The enormous growth of the subject since the publication of the fourth edition in 1939 has made the subdivision into chapters according to chemical classification unworkable. The author has, therefore, redistributed the material according to the biological activity of the drugs, except for a part devoted to the consideration of dyestuffs, sulphonamides, the organo-metallic compounds and antibiotics to assist in clarifying the subject matter.

This work will be of particular value to Research Chemists, Chemical Laboratories, University Departments of Chemistry and Biochemistry, Libraries in Universities and the large chemical firms.

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Organic Chemistry, Volume I
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I. L. FINAR
B.Sc., Ph.D., A.R.I.C.

The aim of the third edition of this book remains the same as that of the earlier ones; only the fundamental principles of organic chemistry have been described, and the subject matter covered should serve as a background to those reading for General and Special Honours degrees in Chemistry.

The text has been completely revised; many sections have been expanded and new material has also been added. Among the expanded sections are those dealing with the electronic theories of organic chemistry, Sn and E mechanisms, the Diels-Alder reactions, aromatic substitution (which includes an account of the ortho-para ratio), steric effects, and heterocyclic compounds containing one heteroatom. The new material that has been described includes the following subjects: conformational analysis, the use of isotopes in organic chemistry, molecular diagrams, channel complexes, clathrates, ferrocene, and various mechanisms.

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Phosphonitriles Discussed at ACS Meeting by Albright and Wilson Research Leader

RECENT advances in preparative chemistry, in experimental methods and in theoretical interpretation, are at last causing some parts of phosphorus chemistry to become considerably more coherent than they have been up to now suggests Mr. N. L. Paddock, head of the physical chemistry section of Albright and Wilson's Research Laboratory, who was giving a paper on 'Recent progress in phosphorus chemistry' at the American Chemical Society meeting in Boston this week.

To illustrate his paper Mr. Paddock referred to recent work on the phosphonitrilic series of compounds. Latterly much work has been done in the specialised field of polymer chemistry by a team of research chemists working in the Albright and Wilson Central Research Laboratories in Oldbury, under Mr. Paddock's leadership. As a result of this work, the company announced a few months ago that it had become commercially practicable for them to separate trimeric and tetrameric phosphonitrilic chlorides from the commercial mixture of cyclic and linear polymers. The announcement made A and W's the first chemical manufacturing company in the world to be able to separate phosphonitrilic polymers on a commercial scale.

Recent attention to this intriguing series of inorganic polymers has been largely occasioned by the demand for high temperature-resisting materials. Rocket and space research has meant intensification in the effort to discover materials that can maintain their properties in spite of exposure to extremely high temperatures.

The phosphonitrilics were described by Mr. Paddock thus: "In general, phosphonitrilics may be linear or cyclic, the linear compounds being highly polar and chemically reactive. The cyclic chlorides are comparatively unreactive, though a number of derivatives have been made from them which retain the ring structures, and can carry groups useful for further chemical synthesis."

Two types of cyclic polymer were particularly considered by Mr. Paddock, the fluorides and the methyls. The highest member of the fluoride series to be isolated so far has a 34-membered ring; this is the longest homologous series known in inorganic chemistry, and the stability of the members makes them very suitable for detailed physico-chemical study. They hydrolyse slowly in damp air, but are otherwise very similar to the fluorocarbons, particularly in being very poor solvents.

They all polymerise at high temperatures to an elastomeric substance, which may be of interest as an inorganic polymer if its hydrolytic stability can be improved. The phosphonitrilic methyls are quite different; the trimer and tetramer are comparatively high melting, and are soluble in water. They do not polymerise on heating.

These and other chemical facts were related in three ways stated Mr. Paddock; by use of the Franklin concept of ammonia as a parent substance of the series, by pointing out the close connection in method of preparation with that of other inorganic polymers, and by considering them in relation to modern theories of chemical binding.

In particular, he showed how orbitals of different symmetry interact so as to give rise to the characteristic properties of the phosphonitrilics; which may be regarded as a new type of aromatic compound, in which the requirements of ring size and planarity are relaxed in comparison with the carocyclic series.

The relevance of these ideas to some of the chemistry of silicon and sulphur has been considered by Mr. Paddock, and also to phosphorus compounds other than the phosphonitrilics. He concluded that while d-orbitals were often required to account for the chemistry of many compounds of the second row, their employment was by no means universal. In spite of much systematisation achieved, many problems still remain for future solution.

New Factory Uses Beater Treatment for Paper

TREATED paper is being made by the beater method at the new factory at North Hykeham, Lincs, opened by Jointine Products Ltd.

Materials suitable for use in such trades as book coverings, boots and shoes, cases, industrial tapes and jointing materials are produced from a base material which can be made either by the impregnation of an already formed sheet with resins or rubber-like substances or by the incorporation of these substances during the formation of the sheet material. These two processes are often referred to as impregnation and beater treatment respectively. Jointine Products had formerly used only the impregnation method.

Because the high cost of raw materials makes the prevention of waste more important than speed in production the machine has been limited to a width of 80 in. and a speed range of 5 to 50 feet a minute.

Owing to the inflammable nature of some of the solutions to be handled all the equipment in one section had to be flame-proof and this section was divided from the rest of the building by flame-proof doors and walls. A Monitor roof was selected because a number of air ducts could be incorporated in each monitor section with a minimum obstruction of light while remaining out of sight. This type of roof provides good illumination and forms an explosion relief in case of fire.

The company's technical development has been carried out under the direction of Dr. P. H. Amphlett. Mr. A. D. Ward is managing director.

Boots Airdrie Factory Completes 10 Years

WHEN the Airdrie factory of Boots Pure Drug Co. began operations in April 1949 only about a dozen lines were manufactured there, but the plant was a packaging unit for some 70 lines made elsewhere: today when the plant completes its first ten years it makes about 70 products itself, besides packaging many others manufactured elsewhere.

The plant was built on a 150-acre site 10 miles east of Glasgow, the decision to move so far from the parent plant at Beeston, near Nottingham, being prompted by shortage of labour. It has provided work for an annual average of about 600 people, 40% being men.

A section of the 'Wets' packaging department in the Airdrie plant of Boots Pure Drug Co.

Grangemouth Plant Strike

WORK on a new plant for the production of polythene at Grangemouth was brought to a standstill when a claim for 6d an hour height and dirty money was refused and 510 steel erectors and other workmen walked out.

The plant, already two months behind schedule, is being built for Union Carbide Ltd.

Overseas News

CARBIDE-ACETYLENE TO BE RAW MATERIAL OF EAST GERMAN PLASTICS EXPANSION

THE East German Government states that by 1965 the annual plastics production of the country will be 2.6 times that for 1957 and the output of fully-synthetic fibres 6.8 times that of 1957. Total plastics production in 1965 will have reached 300,000 tonnes, providing 16 kg. of plastics per head of population in that year as against 7 kg. in 1960 and 6 kg. in 1958.

A sum of Eastmarks 110 million (taken as Westmarks, value is about £9¼ million) on loan from the Soviet Union is to be invested in the East German concerns Bunawerke and Elektrochemisches Kombinat Bitterfeld and elsewhere for the development of plastics production. Production is getting under way at the Sebnitz plant, in Saxony, of glass-fibre reinforced polyester block and profile, and production there of polyester corrugated 'glass' and tubes of up to 30 cm. diameter is being planned.

Experimental production of high- and low-pressure polythene has been in hand for some time, and both types will soon be in large-scale production. Production of glass-fibre reinforced phenolic resins has begun, as well as that of asbestos- and glass-fibre reinforced silicon resins. Amino-plastics are to be developed and brought into large-scale production, raw material being the brown coal, air and water used at the Leuna-Werke plant.

Main raw materials for plastics are to be carbide-acetylene from the Bunawerke and Piesteritz plants and mineral oil. As home supplies of this second commodity are insufficient, imports of it from the Soviet Union, which in 1957 stood at 1.5 million tonnes, are to be increased to 4.8 million tonnes by 1965 and a pipeline is to be laid from Russia to East Germany. At the same time carbide production within East Germany will be raised 1 million tonnes annually by 1965.

Indonesians Take Over Dutch Companies

Two Dutch pharmaceutical companies Mij. Nakula (formerly under the name of Bavosta) and Mij. Nurani (formerly Jm. van Gorkom) have been brought under the immediate control of the Indonesian Government.

Canadian Thorium Recovery Plant Starts Up

Rio Tinto-Dow Ltd., have begun tune-up operations at their thorium recovery plant in the Elliot Lake area of Northern Ontario.

The $1,000,000 plant is the first of its kind designed to recover thorium values from solutions formerly discharged to waste as a result of uranium milling operations. It uses waste products from the Algom Uranium Mines' Quirke Mine treatment plant.

The plant will be the sole producer of thorium compounds from Canadian sources. Early operations are to be largely experimental. While the plant has been designed and built as a production unit, the processes have not previously been tested on a pilot mill scale.

The company plan to turn out only one final product to begin with—crude thorium cake, essentially a calcined thorium oxide.

Italian Co-operation in New Yugoslav Fertiliser Plant

The Lukavac coking plant near Tuzla, Yugoslavia, is shortly to begin the erection of a nitrogen and synthetic fertiliser plant using waste gases from the coking plant as raw material. Capacity will be 125,000 tonnes of ammonium saltpetre fertiliser annually, and the plant's cost 10,500 million dinar. The supplier of equipment for the plant, the Italian Ansaldo concern is allowing long-term credit facilities. Plant worth some 2,000 million dinars will be produced by Ansaldo in co-operation with Yugoslav firms, the rest to come direct from the Italian firm.

Occlusion of Alkylsilanes by Urea

Urea occlusion compound formation is a method of separating molecules on the basis of size and shape. According to a report just issued (PB131670 from OTS, US Department of Commerce, Washington, 25, DC) urea occlusion has until now been used only for the separation of hydrocarbon components of kerosene for jet fuels, but this is claimed to be the first application to alkylsilanes. Results have indicated that length and cross-sectional diameter of the molecule are the limiting factors. Scale models can be used to predict which alkylsilanes will form urea occlusion compounds, that are a convenient way of storing many compounds incorporating the highly reactive Si—H bond. Separation and purification of many alkylsilanes can be achieved in the same way.

Higher U.S. Consumption of Liquid Gas

Liquid gas consumption in the U.S. rose by 9½% last year on the 1957 figure to 181 million barrels (some 16 million tons). Of this, 45 million barrels went to the chemical industry, 20 million barrels for fuel purposes, 9 million barrels to the synthetic rubber industry and the remaining 107 million barrels for other purposes, including agricultural ones.

Dortmund Firm to Expand Carbon Black Capacity

The Dortmund firm of K.G. Deutsche Gasrusswerke G.m.b.H. and Co., whose plant was erected in recent years by funds from the Frankfurt Degussa concern is to expand. Last year the plant, which manufactures furnace carbon black, was working to full capacity, but can now no longer meet demand. At the same time the similarly-named concern Deutsche Gasrusswerke G.m.b.H., also of Dortmund, and also associated with Degussa, plans to cut its production programme as it no longer expects to be able to use its capacity satisfactorily. This second firm makes special carbon black for the natural rubber industry, demand for which is falling with the growth of synthetic rubber sales from home and foreign producers.

Czechoslovak Granulated Superphosphate Production

First factory in Czechoslovakia to make neutralised granulated superphosphate has gone into production. It is at the Moravian Chemical Works in Prerov. Daily output of the new fertiliser will be 200 tons.

Chile May Build Plant for Cellulose

The Chilean Corporación de Fomento announces that it is considering the possibility of erecting a cellulose plant with an annual production capacity of 70,000 tons. Cost would be $24 million.

Sweden Speeds Virus Research in War on Forest Insects

To speed up research in the use of small pathogenic micro-organisms, such as virus, bacteria and fungi, in the war against noxious forest insects, the Swedish Forest Research Institute has received a grant of £12,400 from the Wallenberg Foundation of Sweden. It has been found that forest insects have developed resistance to DDT, hexachlorine and other chemical agents.

It is proposed to develop viruses, each of which will attack one type of insect, and each of which is 90-95% active. The virus content of only five infected insects is said to be enough to spray five acres.

Battelle Develop High-Pressure High-Temperature Cells

Studies in heretofore largely unexplored areas of materials research are under way at Battelle Memorial Institute, Columbus, Ohio. Key to these studies is equipment designed to give a combination of ultra-high pressure and temperature which provides a relatively new area for investigation. Four high-pressure, high-temperature cells developed at the re-

search centre have just been completed.

This newest cell will be capable of handling specimens up to one-fourth cubic inch in size. The other three, developed over a two-year period, have produced reactions at temperatures in excess of 5,000°F. and at pressures in excess of 1 million p.s.i. Operating at room temperature, the cells have provided pressure well in excess of 2 million p.s.i.

R. B. Fischer, chief of Battelle's Physical Metallurgy Division, states that this equipment offers "exciting possibilities for extending the boundaries of research in metallurgy and associated fields." It provides a new tool for studying existing materials and making new materials by facing atoms into positions they are reluctant to take during conventional processing. In other research the high-pressure, high-temperature cells offer equally promising possibilities. Dr. Charles M. Schwartz, chief of the Structural Chemistry Division, reports that the equipment has already been used to investigate the effects of ultra-high pressure on insulators and semiconductors. Changes in the structure of many materials have already been effected through the use of pressure, and in at least one instance, a new form of matter has been obtained at Battelle.

Celanese Corp. to Produce High Energy Fuels

Celanese Corporation of America have announced that they will start development on solid propellants. The company say this will be a logical extension of their present activities in polymers and synthetic organic chemicals. Also Celanese can produce certain chemicals being considered for future propellants.

Negev Phosphate Extensions

The Negev Phosphate concern, of Israel, is to be allocated the sum of £135 million by the country's Government for the extension of the installation for the enrichment of phosphates. These improvements will include the laying of a new water line and the setting-up of a connection with Israel's electrical grid. They will enable Negev Phosphate to increase their annual production capacity to 250,000 tons of phosphates, of which 150,000 tons will be for export.

Peru's First Ammonia Plant on Stream Shortly

In full production soon will be Peru's first synthetic ammonia plant. In addition to producing ammonium sulphate and ammonium nitrate fertilisers, it will also make available anhydrous ammonia, nitric acid and ammonium nitrate. The new plant which is located at Callao, is operated by Fertisa-Fertilizantes Suiteticos S.A. Peruvian investors have put $5 million in the project and an additional $5 million has been raised through an Italian bank on a long-term loan.

Construction and design of the new plant has been by the Montecatini company of Italy. The plant will use a Fauser-Montecatini process. Hydrogen will be produced by partial combustion of fuel oil. Oxygen and nitrogen are obtained from a conventional air fractionation plant. The partial combustion plant has an annual capacity of 16,500 metric tons of fuel; some 5,700 tons of sulphuric acid will be required yearly. About 1,500 tons of concentrated nitric acid from this plant will be used in explosives' manufacture and 1,900 tons will be available to Peru's chemical industry.

Granulated ammonium nitrate fertiliser will be made in a plant using revolving disks; this technique has been only employed up to now in the European pharmaceutical and sweet-making industries.

U.S. Sales of Plastics and Resins in 1958

Preliminary figures of sales of plastics and resins materials in 1958 published by the U.S. Tariff Commission show that the total reached 3.96 thousand million lb., a 4.5% increase; production in both years was about the same—4.3 thousand million lb.

Largest sales gain was by polythene with 840 million lb.—a 27% increase over 1957. Production of this plastics material at 864 million lb. topped the previous year by 22%. Styrene production and sales were up slightly but phenolics showed a sharp drop in both sales and production. Sales of vinyl resins showed a small increase but production dropped about 7%.

New Urea Plants

Canada's latest urea plant will be that of Consolidated Mining and Smelting of Canada Ltd., at Calgary. A $5 million unit is to be constructed with an estimated capacity of 36,000 tons a year. It is scheduled to be completed by mid-1960. The plant, which will be integrated with Consolidated Mining's ammonia and ammonium nitrate production at Calgary, will make high purity urea (46% nitrogen) for Western Canada and the U.S. Present producers in this area are Shell (35,000 tons a year) and Hercules (20,000 tons a year). Expected in production shortly is Cyanamid of Canada's 66,000-tons-a-year plant at Hamilton, Ontario, which will serve eastern Canadian markets and the U.S.

At Freeport, Grand Bahama Island, Bahamas, Caribbean Chemical and Fertiliser are to build a $15 million anhydrous ammonia and urea plant. Initial capacity will be 100 tons a day of ammonia (based on a heavy oil source for synthesis hydrogen) and 54,000 tons a year of urea.

Norwegian Chemical Production Down

Production in the Norwegian chemical industry in 1957 was down by about 10%, the government's annual report states. Excluding herring oils, production was 4% down. Nitrates production by Norsk Hydro equalled about 225,000 tons of nitrogen, 3% less than the previous year. Carbide production increased 15% to about 70,000 tons, with Norsk Hydro's new factory in operation from the beginning of the year.

New Ethylene Oxide Plant for Sicily in 1961

Mr. M. G. Dial, president of Union Carbide Corporation, U.S., has announced that *Celene S.p.A.* (in which Union Carbide and Italian Edison participate) is going to build at Priolo, Sicily, a plant for the production of ethylene oxide and its derivatives. The new plant is to go on stream in 1961 with an initial output of 12,000 metric tons a year.

Russians Build Rumanian Superphosphates Plant

A superphosphates plant with an initial output of 150,000 tons a year rising within 12 months to 250,000 tons a year, has been commissioned in Rumania. The factory, at the Navodari sulphuric acid and chemical fertiliser works, was designed by Russian experts and most of its equipment comes from the Soviet Union.

Low-Temperature Production of Ozone

FROM National Bureau of Standards' studies of the low-temperature reactions of atomic oxygen in their free radical programme, has come a laboratory method for efficient conversion of oxygen to ozone. There is also a possibility of commercially producing ozone.

In the process, developed by R. A. Ruehrwein and J. W. Edwards of Monsanto Chemical Co. and J. S. Hashman of Callery Chemical Co. oxygen is sent through a high-frequency electric discharge into a Pyrex U-tube immersed in liquid nitrogen. The arrangement is such that a glow discharge occurs in the oxygen stream just above the liquid nitrogen level. Ozone is then produced as the dissociation products in this discharge condense on contact with the liquid nitrogen-cooled surface. The liquid ozone forms in a narrow band on the wall of the U-tube a few millimetres below the glow discharge and is drained off. Comparison of the yield of ozone with the volume of oxygen introduced into the system shows that 100% conversion is possible under certain operating conditions.

Conversion efficiency for this arrangement depends, it is stated, on flow rates, reaching its maximum at rates of 5.7 c.c./min. and lower. At such low flow rates, all oxygen introduced into the system is converted so that pumping becomes unnecessary. Much of the available energy, however, is wasted at these rates, the energy efficiency being at its peak with much higher rates up to 360 c.c./min. Above this limit, the 135 watts of microwave power has not been sufficient to maintain a stable glow discharge.

PEOPLE in the news

● MR. D. J. BIRD, a vice-chairman of Fisons Ltd., has retired from the company after 30 years' service.

Mr. Bird, who is 65, has played a leading role in the U.K. fertiliser industry and in agriculture. During the war, as deputy controller of the fertiliser control at the Ministry of Supply, he was responsible for the distribution and price of fertilisers. Later he was appointed controller of miscellaneous chemicals.

He was elected president of the Fertiliser Manufacturers' Association in 1939, and on his return to Fisons after the war was again elected to the F.M.A. council, becoming vice-president in 1945 and president for the second time in 1946. In 1950 when the Minister of Agriculture reappointed his advisory committee on the Fertiliser and Feeding Stuffs Act, Mr. Bird was invited to serve as a trade member, and was elected chairman of the fertiliser sub-committee. He was also one of the two trade advisers to the Board of Trade on the phosphate fertiliser subcommittee of O.E.E.C. He was president of the International Superphosphate Manufacturers' Association from 1953 to 1955.

● DR EDWARD HUNTER, B.Sc., Ph.D., research director of I.C.I. Alkali Division, whose new laboratory extensions at Winnington were opened recently by SIR CYRIL HINSHELWOOD (CHEMICAL AGE, 14 March, p. 468) went to Winnington in July 1929. He has been associated with polythene since the early days, having been put in charge of semi-technical development of the process and in 1936 was associated with the design and technical supervision of the first commercial plants. From 1942 he was in charge of polythene research at Winnington; in the following year he visited du Pont polythene establishments to exchange information. He was appointed deputy research manager of the division in 1946 and followed DR. J. FERGUSON as division research director in 1950. It was appropriate that Sir Cyril should have opened the new extensions for it was under his guidance that Dr. Hunter worked at Winnington on high pressure gas reaction kinetics (nitrous oxide decomposition) in the early 1930s.

Dr. E. Hunter

● Special annual insignia awards in technology have been awarded for 1959 by the City and Guilds of London Institute to MR. H. JACKSON, who until his recent retirement was joint managing director of I.C.I.'s Dyestuffs Division, a member of the Board of Trade Dyestuffs Advisory Committee from 1950-58 and chairman of the trustees of the Perkin Centenary Trust; DR. H. SCHOFIELD, a distinquished structural engineer, who was for many years principal of the Loughborough College of Technology; AIR COMMODORE (RETD.) W. C. COOPER, formerly director of communications, research and development, Ministry of Supply, and now chairman and managing director of Manlove, Alliott and Co. Ltd., Nottingham, who are developing a range of process control equipment, particularly steam autoclaves; AIR COMMODORE (RETD.) F. RODWELL BANKS, sales director of the Bristol Siddeley Engine Co. Ltd., who was for some years technical manager and chief engineer with Associated Ethyl Co. Ltd.: and MR. W. A. EDWARDS, managing director of Wm. Lacey (Loughborough) Ltd., an authority on hosiery and dyeing who introduced the Negafel shrink-resistant process in a number of countries.

● MONSIEUR E. J. SOLVAY, president of Solvay et Cie, Brussels, and a direct descendant of the discoverer of the ammonia soda process that bears his name, has been appointed president of the Society of Chemical Industry. He will take up office in succession to Sir Robert Robinson at the annual general meeting in Glasgow on 10 July.

● MR. B. F. J. SCHONLAND, F.R.S. director, Atomic Energy Research Establishment, Harwell, is to receive an hon. D.Sc. at Southampton University on 3 July.

● MR. W. A. HARTOP, managing director of George Kent Ltd., sailed on 2 April from Southampton on board the *Capetown Castle* for a ten-weeks' tour covering much of South Africa and the Federation of Rhodesia and Nyasaland. His itinerary is designed not only to further export sales, but also to strengthen the close relationship between the parent company and the friends and business interests of George Kent (S.A.) (Pty.) Ltd. of Johannesburg, and also of the Kent branch in Salisbury, S. Rhodesia.

● MR. JOHN ANDREWS has been appointed assistant director of foreign operations of Godfrey L. Cabot Inc., Boston, Mass. He is a former managing director of Cabot Carbon Ltd., Ellesmere Port, and since September 1955 has been president and director general of Cabot France S.A. MR. D. E. O'MULLOY, former works manager at Ellesmere Port and later temporary assignment first to Cabot France S.A. and then to Australian Carbon Black Pty. Ltd., has been appointed president and director general Cabot France S.A. MR. WILLIAM CHARLES BEECH, formerly production superintendent Cabot Carbon Ltd., has been appointed interim works manager of Australian Carbon Black Pty. Ltd. and will train workers for the new carbon black factory soon to go into production near Altona, Victoria.

● SIR EWART SMITH, F.R.S., who has retired from the board of Imperial Chemical Industries Ltd., obtained 1st class honours in the mechanical science tripos at Sidney Sussex College, Cambridge, and joined Synthetic Ammonia & Nitrates Ltd. (later the Billingham division of I.C.I.) in 1923, just before the start-up of the first plant, and subsequently played a major part in the development of Billingham, becoming its chief engineer in 1932. He was seconded to the Ministry of Supply in 1942 to be chief engineer and superintendent of armament design. He returned to I.C.I. in 1945, when he was appointed technical director, and was knighted in 1946, and in 1955 he was made a deputy chairman of the company. He was a leading advocate of increased productivity, and the harnessing of work study and other modern techniques of management to that end. He was a member of the British Productivity Council and chairman in its early days.

Sir Ewart Smith

Sir Ewart served on numerous bodies. He was made a fellow of the Royal Society in 1957, and is this year's president of the Engineering Section of the British Association.

● MR. D. A. SENIOR, 35, has been appointed to the newly created post of scientific attaché to the British Embassy in Moscow. He will advise the British Ambassador, Sir Patrick Reilly, on scientific matters and report on Soviet scientific and technical development. Mr. Senior will hold the rank of senior principal scientific officer and will be on the staff of the Department of Scientific and Industrial Research. He has left Britain for a preliminary visit to Moscow, and will then spend some time briefing himself on all aspects of civil science in this country and improving his knowledge of Russian. Mr. Senior joins the D.S.I.R. from the Royal Naval Scientific Service. Since 1950 he has been at the Admiralty Research Laboratory, Teddington. Since 1956 he has also been studying combustion on a part-time basis in the Chemical Engineering Department of Imperial College, London.

Commercial News

• Glaxo Raise Interim to 5½%: Profit Down
• Dominion Tar's Highest Earnings Yet
• Unilever Developing More Detergents
• Potter and Clarke Increase Dividend to 20%

Glaxo Laboratories

A decline of 12% in group net profit of Glaxo Laboratories Ltd. to £1,178,000 in the six months to 31 December 1958, is reported, compared with the corresponding period of 1957. The interim dividend, however, is effectively raised from 4 1/6% to 5½%: the total for the year to 30 June 1958 was equivalent to 11½% on the ordinary capital as increased by a one-for-two scrip issue.

Group turnover was 3% less than the corresponding period of the previous financial year and 6% less than the six months ended 30 June 1958. Consolidated results for the period including for the first time those of Allen and Hanbury's are as follows (to provide comparable figures for the same period a year ago figures for Allen and Hanburys have been added): Trading profits £2,418,000 (£2,782,000); taxation (estimated) £1,397,000 (£1,495,000), net balance £1,178,000 (£1,341,000).

The directors report that the decline in profit reflects the highly competitive conditions existing in many markets. They state that there is little indication of improvement in trading conditions, but the introduction of new products should result in some increase in turnover and profitability during the second half of the current year's trading.

Metal Industries Ltd.

Metal Industries Ltd., who recently extended the closing date for their offer to purchase the whole of the share capital of Avo Ltd., announce that acceptances have reached 99.7%.

Final consideration for the acquisition will be £768,066 payable in cash and the issue of £240,967 new ordinary stock in Metal Industries.

This new issue will bring M.I.'s total issued capital to £6,140,967.

Dominion Tar and Chemical

Consolidated sales of Dominion Tar and Chemical Co. Ltd. and subsidiaries, including Howard Smith Paper Mills, amounted to $181,376,516 in the year ended 31 December 1958, an increase of 2.1% over sales of the previous year of $177,710,940. Building materials made up 27% of total sales, chemical processing 23% and pulp and paper 50%, as compared with 25%, 24% and 51% respectively in 1957.

Consolidated net profit was $7,304,497, which, after preferred dividends, was equal to $1.40 per share of common stock. This compares with $6,560,586, or $1.25 per share common in 1957. Earnings both per share and in total dollars were the highest in the company's history.

Capital expenditure was $12,798,316 and included a new recovery furnace at the Howard Smith Mill in Cornwall and a new coal tar distillation plant in Hamilton. Work continued on the new rock salt mine at Goderich, Ont.

The purchase of the assets of Gypsum Lime and Alabastine Canada Ltd. was effected on 23 February 1959. Earlier the authorised common share capital of Dominion Tar was increased from 5,000,000 to 10,000,000 shares.

Potter and Clarke

Potter and Clarke Ltd. made a profit of £16,666 (£20,282) before tax of £489 (same) and have declared a dividend of 20% (12½%).

SNIA Viscosa

An increase of 300% in the production of the polyamide fibres Lilion and Ri.san is reported by the Societa Nazionale Industria Applicazioni Viscosa of Milan. Production of Merinova protein fibre dropped in 1958 mainly because lower international wool prices made it less competitive.

Production of acetate fibres increased by 16.7%, exports increasing by 67.1%.

Pilot plant was developed for the production of other synthetic fibres in the polyamide (MDX6), the polyacrylonitrile (Crilene) and polyester classes. Glass yarns are also being developed.

Synthetic resins were developed during 1958 and work is being done on further new resins. Continuing their policy of becoming as self-sufficient in raw materials as possible, the company, after expansion of their cellulose and soda production plants and construction of a sulphuric acid plant, began erection of a large plant for producing carbon disulphide, which will go into operation next year.

A net profit of 2,138,067,435 lire (£1,220,222) compared with 1,965,297,017 (£1,127,000) was made and a dividend of 100 lire (about 1s 1d) a share is being paid.

Unilever

As research progresses more synthetic detergents will be produced for specific uses, Lord Heyworth, chairman of Unilever, said in discussing the annual report at a Press conference. He said that though the company had never stated what share of the U.K. detergent market it had it was generally reckoned to be about 50%.

Sales of soapless detergents continued to make good progress, but soap tonnage sold was lower than in 1957. Total sales of washing products were unchanged, but the value increased from £279 million to £291 million, reflecting the higher detergency obtained, weight for weight, from synthetic detergents.

Market Reports

CALL FOR AGRICULTURAL CHEMICALS MAINTAINED

LONDON There has been a good movement of supplies to the home consuming industries, mainly against contracts, and a moderate flow of new business has been reported. Export trade remains on a satisfactory scale with Australia and India the chief outlets. The official returns for the first two months of the year show an overall improvement on the corresponding period in 1958.

The call for agricultural chemicals is fully maintained and some pressure for deliveries has been experienced.

There have again been no new features in the coal-tar products market, and the demand is steady with perhaps a little more interest in the pyridines.

MANCHESTER Steady price conditions feature pretty well all sections of the Manchester market for heavy chemical products and the contract movement of the soda compounds and most other lines during the past week has been back to the pre-holiday level, with a fair number of enquiries in circulation. The shipping movement in the aggregate is around the level of recent months, though there has been a contraction in the takings of Australia and several other outlets. There is a fair demand for fertilisers, mainly compounds, with a quietly steady trade passing in the tar products.

GLASGOW Although the position has been spasmodic in some sections of the industry, business generally has been reasonably active during the past week in the Scottish market. Demands covered the usual range of heavy chemicals and emphasis was on those for current requirements. Prices have been more or less steady with some variations taking place. The report on agricultural chemicals is still one of continued activity centred mostly on bookings for forward requirements.

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Ashton Gate Works, **Bristol, 3.** TELEPHONE: 64041. And **Falkirk**

OTHER OFFICES: 352-364 Euston Road, **London,** N.W.1 (Head Office). TELEPHONE: EUSton 3456
110 Cannon Street, **London,** E.C.4 (Export). TELEPHONE: MANsion House 6034
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TRADE NOTES

New Sales Department

Electro-Hydraulics Ltd. recently announced the establishment of a new industrial hydraulic sales department under the direction of Mr. L. Rumley, sales director of Electro-Hydraulic Ltd., and Conveyancer Fork Trucks Ltd.

Electro-Hydraulics Ltd. are manufacturers of hydraulic equipment for aircraft and of fork-lift trucks. The formation of the new department signifies a development of sales in the industrial field and already the company are offering a wide range of solenoid valves and hydraulic cylinders. They will undertake design, development and manufacture of hydraulic, electro-hydraulic and servo systems for numerous applications.

Morgan Department Move

Increases in the demand for the sintered metal products of The Morgan Crucible Co. Ltd. have led to a move to larger premises. The sales office has been moved to Wandsworth Works, Point Pleasant, Wandsworth, London S.W.18, and a new factory and laboratory have been established there for the production and development of Sinterlink. This combines plant and facilities previously situated at Battersea and Norton, Worcester.

Phase I of the move has been completed without interruption of output; in fact, output has increased.

The need for these increased facilities has been largely dictated by the expanding employment of Sinterlink sintered metal clutch facing material for heavy duty machinery in such fields as earth moving equipment, machine tools, goods vehicles, industrial engines, marine engines, cranes, tractors and mechanical handling equipment.

Change of Address

Prat-Daniels (Stroud) Ltd., Whitecroft, Nailsworth, Stroud, Glos, makers of fans and grit and dust collectors, have moved from their London office at Westminster Palace Gardens, S.W.1. The London office of the Daniels group, which includes T. H. and J. Daniels, Ltd., British Boiler Accessories, Ltd., and Prat-Daniels (Stroud) Ltd., is now situated at 62-3 Fenchurch Street, London E.C.3.

Instrument Firm's Agents

Baldwin Instrument Co. Ltd., Dartford, Kent, have appointed new agents and technical representatives as follows:

Scotland: Sales and service and technical representation, James Scott & Co. Ltd., 68 Brockville Street, Carntyne Industrial Estate, Glasgow, E.2. Tel.: Shettleston 4206-9.

North of England: Sales and service, Wm. Don & Partners Ltd., Crown Works, Crown Point Bridge, Leeds, 9. Tel.: Leeds 33781-2; technical representative, Mr. J. D. Thornley, Waterhey Cottage, Rivington, nr. Bolton, Lancs. Tel.: Horwich 364.

Midlands: Technical representative, Mr. P. Lawrence, 16 Hawthorn Road, Kings Norton, Birmingham, 30. Tel.: Kings Norton 4476.

The home counties, Wales and West Country will continue to be covered from Dartford.

Filter Aids

The British Ceca Co. Ltd., 175 Piccadilly, London W.1, chemical manufacturers and engineers specialising in gas and liquid treatment, can now supply Clarcel filter aids manufactured in France by their associated company Societé C.E.C.A. from their deposits of high grade diatomaceous earth.

Change of Name

The name of Davis and Thompson Ltd., Watford By-Pass, Watford, has been changed to Datum Metal Products Ltd. The new title bears a closer relationship to their activities, namely, the design and manufacture of the 'Datum' series of instrument racks, cases, control consoles, chassis and panels. The standard Datum ranges are to be augmented by new designs and presentations.

Agencies Sought

Montoil S.A., 25 Rue St. Quentin, Paris, who are agents for several large chemical manufacturing houses in France, Finland, Sweden and Spain, would be interested in representing British chemical manufacturers.

DIARY DATES

TUESDAY 14 APRIL

S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.30 p.m. Spring Lecture.

WEDNESDAY 15 APRIL

S.A.C.—Glasgow: Central Hotel, 7.15 p.m. 'The analytical chemistry of some of the lower phosphorous oxyacids', by Dr. D. S. Payne, and 'Qualitative analysis by solvent extraction methods', by Dr. R. A. Chalmers.

S.C.I. with I.Chem.E.—Birmingham: Coll. Technology, Suffolk St., 6.30 p.m. 'Electrical Engineering in the chemical industry', by Mr. D. Birch.

S.C.I.—Dublin: Shelbourne Hotel, 7.30 p.m. 'The petroleum chemist in the home', by Mr. R. C. Tarring.

S.C.I.—London: 14 Belgrave Sq., S.W.1, 5.30 p.m. A.g.m. surface activity group. 'Surface phases and their importance in the chemical industry', by Sir Eric Rideal.

THURSDAY 16 APRIL

Royal Soc.—London: Burlington Hse., W.1, 4.30 p.m. Bakerian lecture, 'Molecular structure in the polysaccharide group', by Prof. E. L. Hirst.

S.A.C.—London: The Feathers, Tudor St., E.C.4. 6.30 p.m. Biological methods group discussion meeting.

S.C.I.—Liverpool: Senate Room, Univ., 5.45 p.m. A.g.m.; 6.30 p.m., Leverhulme Memorial Lecture, 'Catalysis in industry', by Prof. J. H. de Boer.

S.C.I.—London: 14 Belgrave Sq., S.W.1, 6 p.m. A.g.m. Road and Building Materials Group, followed by 'Adhesion in bitumen macadam', by Mr. R. I. Hughes.

S.C.I.—London: Royal Inst., Albemarle St., W.1, 6.30 p.m. 'Chemistry of the glycosides of digitalis', by Prof. A. Stoll.

S.C.I. with C.S., R.I.C. and Inst. Petroleum—Manchester: Univ., 10.30 a.m. Annual symposium, 'The uses of tracers in chemistry and industry'.

S.C.I.—Newcastle upon Tyne: King's Coll., 6.30 p.m. A.g.m. and short lectures by Saville Shaw medallists.

FRIDAY 17 APRIL

Plastics Inst.—Birmingham: James Watt Memorial Inst., 6.30 p.m. 'Fire and heat resistant materials', by Dr. W. Wilson.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On sale 21 May

Molecular ordering of materials comprising high polymers. Dufour, P. F. J. **780 122**

ACCEPTANCES

Open to public inspection 27 May

Gaseous fuel mixtures. Oxy-Ferrolene Ltd., and Hobbs, J. [Cognate application 27 459.] **813 981**

Refining of petroleum hydrocarbons. British Petroleum Co. Ltd., Northcott, R. P. and Lester, R. **813 831**

Control of chemical plant. Simon-Carves Ltd. **814 087**

Production of artificial filaments, threads, fibres and like filamentary materials from viscose. Courtaulds Ltd. **813 832**

Polymerisation process. Distillers Co. Ltd. [Cognate application 5 421.] **813 905**

Monoazo dyes. Interchemical Corp. **813 906**

Catalytic oxidation of methanol and catalyst and catalyst precursor therefor. Reichhold Chemicals, Inc. **814 073**

Catalysts, catalyt precursors therefor and the catalytic oxidation of organic compounds Reichhold Chemicals, Inc. **814 074**

Producing water-insoluble azo-dyestuffs on the fibre. Farbwerke Hoechst A.G. **813 986**

Process and device for the treatment of textile materials. Sucker G.m.b.H., GEB. **814 127**

Preparation of epoxidised acids, esters and nitriles. Rohm & Haas Co. **813 991**

Production of bacteriophage resistant strains of lactic streptococci. General Electric Co. Ltd. **813 992**

Process and catalyst for oxidation of methanol to formaldehyde. Reichhold Chemicals Inc. **814 075**

Recovery of fluoride material from used aluminium reduction cell lining. Aluminium Laboratories, Ltd. **813 834**

Vinyl acetate polymerisation. Celanese Corp. of America. **814 067**

Production of metallic bonds between surfaces. General Electric Co. Ltd. **813 828**

Protective treatment of zinc surfaces. British Non-Ferrous Metals Research Assoc. **813 994**

Textile materials, films or foils of organic derivatives of cellulose or linear aromatic polyesters. Celanese Corp. of America. **813 908**

Process for production of electrodeposited metal coatings. Dehydag Deutsche Hydrierwerke G.m.b.H. [Addition to 787 186.] **814 131**

Production of cation-exchange resins containing acetic acid groups. Permutit Co. Ltd. [Addition to 776 184.] **813 836**

Method and process of testing applicable to the control of manufactures in which temperature is important. Imperial Chemical Industries Ltd. **814 091**

Process for obtaining olefins directly from unsaturated aldehydes, by catalytic hydrogenation. Soc. Rhodiatoce S.p.a. **813 839**

Polyvinyl alcohol fibres and method of manufacturing same. Kurashiki Rayon Kabushiki Kaisha. **813 838**

Production of titanium alloys in powder form. Dominion Magnesium Ltd. **813 999**

Processes for producing zones having different impurity contents in semi-conductor crystals. Siemens & Halske A.G. **813 841**

Steroid compounds and the preparation thereof. Pfizer & Co. Inc. [Addition to 787 410.] **814 000**

Production of aliphatic mono- and di-carboxylic acids. Celanese Corp. of America. **813 842**

Metallic bonds to a ceramic material. General Electric Co. **813 829**

Supported catalysts. Distillers Co. Ltd. **814 003**

Process for improving the appearance of polymeric synthetic substances, and the resulting products. Geigy A.G., J. R. **813 843**

Process and furnace for the production of carbon black. Cabot Inc., G. L. **814 095**

Treatment of cellulosic textile fabrics with resinous condensation products. Courtaulds Ltd. **813 919**

Cyclopentanophenanthrene compounds. Lasdon Foundation Inc. **813 845**

Stain composition containing water-repellent alkylated amino dyes. Midland Chemical Corp. **813 921**

Heat interaction of high unsaturation rubber with mineral fillers. Esso Research & Engineering Co. **813 922**

Catalytic reactors. Soc. d'Electro-Chimie, d'Electrometallurgie et des Acieries Electriques d'Ugine. **813 850**

Reaction product of triethyl phosphite and trichloroacetyl chloride. California Spray-Chemical Corp. **814 010**

Steroid compounds. Merck & Co., Inc. **814 069**

Densification of ink grade carbon blacks. Cabot Inc., G. L. **814 101**

Preparation of substituted dithiobiurets. Monsanto Chemicals Ltd. **813 926**

α-Benzyl-γ-methyl-N-trityl-L-(+)-glutamate and alkyl homologue thereof. Uclaf. **813 927**

Process for the effective prevention of precipitates of insoluble metal compounds from textile treatment baths. Badische Anilin- & Soda-Fabrik A.G. **813 929**

Control of chemical or physical processes. Imperial Chemical Industries Ltd. **813 855**

Treatment of articles made of polymethylene. U.K. Atomic Energy Authority. **813 930**

Herbicidal or plant growth regulant compositions. Fisons Pest Control Ltd. **813 931**

Method of and means for defoaming liquids. Warren Co., S. D. **813 856**

Plant for filling liquefied gas containers. Shell Research Ltd. **814 027**

Nickel-chromium-cobalt alloys. Mond Nickel Co. Ltd. **814 029**

Regeneration of catalysts. Reichhold Chemicals Inc. **814 076**

Electrolytic production of aluminium. Kaiser Aluminium & Chemical Corp. **814 031**

10-(Aminoalkyl'-trifluoro-methyl phenothiazine derivatives. Smith Kline & French Laboratories. **813 861**

Production of alumina sol. American Cyanamid Co. **813 937**

Preparation of a motor gasoline with an octane number of at least 95. Bataafsche Petroleum Maatschappij N.V., De. **814 032**

Non-corrosive compositions comprising polymerised olefines. Dow Chemical Co. **813 864**

Polyepoxy polyethers, their polymers and derivatives. Bataafsche Petroleum Maatschappij N.V., de. **813 865**

1 : 3-Di-substituted-5-pyrazolones and their use in colour photography. Ilford Ltd. **813 866**

Purification of esters of dicarboxylic acids. Distillers Co. Ltd. **813 867**

Method for forming thermoplastic resinous materials into expanded foam structures and articles thereby obtained. Dow Chemical Co. **813 941**

β-Halogoethylamine derivatives. Gyogyszeripari Kutato Intezet. **813 868**

Degasser. Cornell Machine Co. **813 869**

Aqueous coating compositions. Rohm & Haas Co. **813 947**

Production of 2-cyanoethoxy-ethanol. Union Carbide Corp. **813 950**

Penicillin salt and therapeutic preparations containing same. Pfizer & Co. Inc., C. **813 879**

Modified cadmium sulphide colours or pigments. Harshaw Chemical Co. **813 952**

Polymerisation of ethylene. Soc. des Usines Chimiques Rhone-Poulenc. **813 780**

Process for production of cottonseed oil based coating compositions. Siddiqui, S., and Aslam, M. **813 955**

Tertiary amines and their salts and the production thereof. Thomae G.m.b.H., K. [Addition to 807 835.] **814 152 & 814 153**

Dehydrating formaldehyde by distillation and partial condensation. Du Pont de Nemours & Co., E. I. **814 119**

Vaccine products and methods of producing same. Parke, Davis & Co. **813 987**

Vinyl acetate polymerisation. Celanese Corp. of America. [Divided out of 814 067.] **814 068**

1, 1, 1-Trichloro-2, 2-bis (chloronitroanilino)-ethanes. Diamond Alkali Co. **813 956**

Preparation of morpholines and piperazines. Jefferson Chemical Co. **813 957**

Clinical dextran and method for producing same. Commonwealth Engineering Co. of Ohio. **813 960**

Vulcanisation of isoolefin-polyolefin polymers. Esso Research & Engineering Co. **813 964**

Oxidative polymerisation of viscous liquids. Technion Research & Development Foundation Ltd., Heimann, H., Kohn, D. H., and Zewi, I. **813 885**

Thiophosphoric acid esters. Farbenfabriken Bayer A.G. **813 966**

Method of producing the chlorides of aromatic mono- or polycarboxylic acids. Imhausen Werke G.m.b.H. **813 888**

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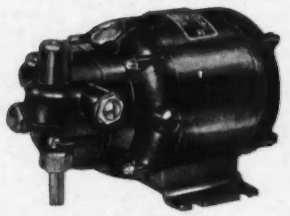

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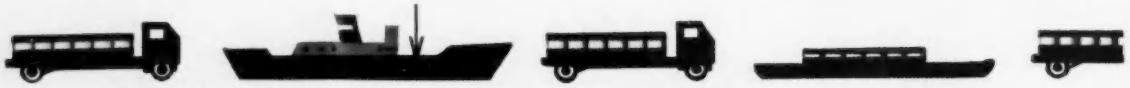

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